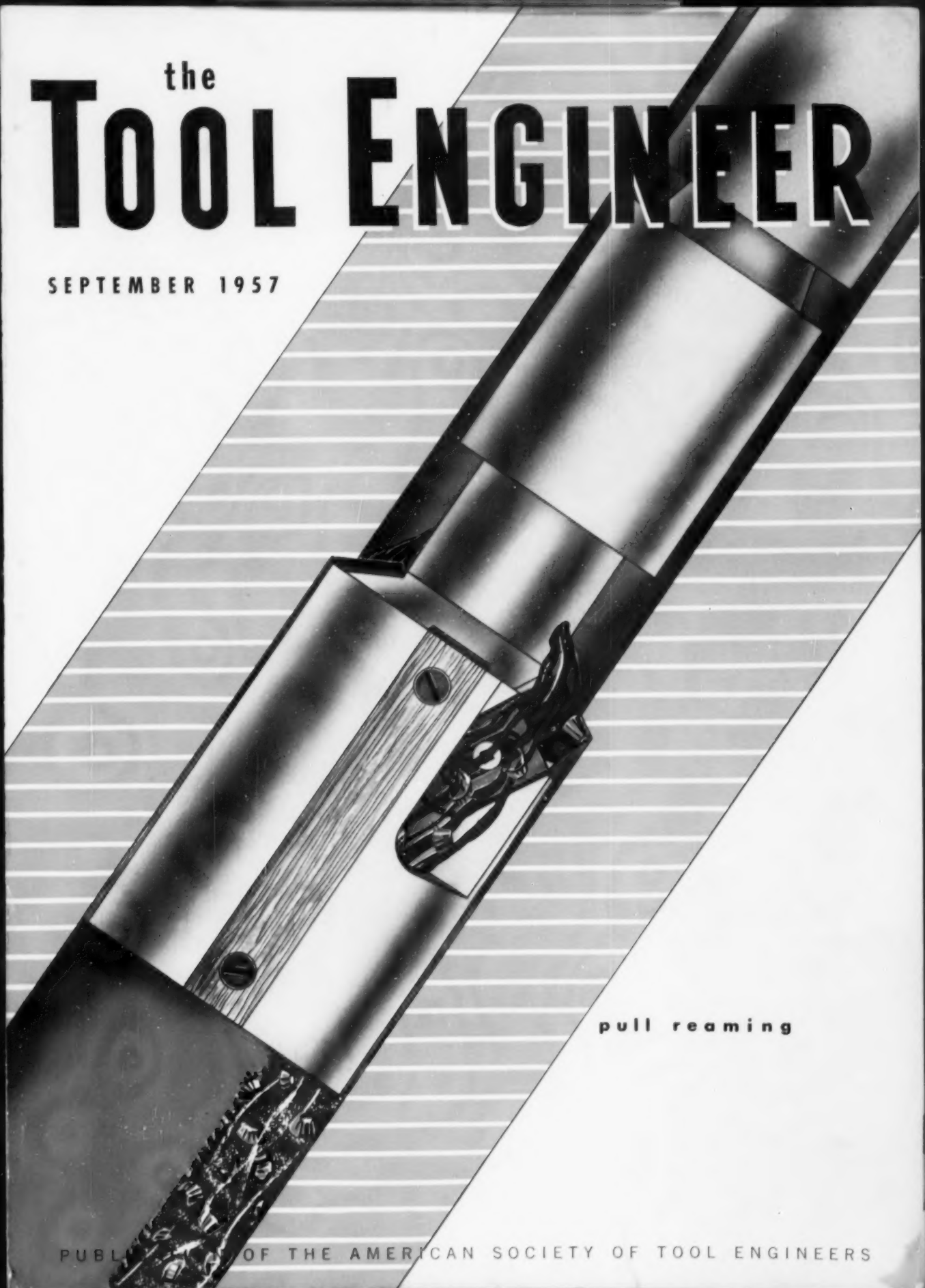
# the TOOL ENGINEER

SEPTEMBER 1957



pull reaming

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

# NEW CAM OPERATED BORE-MATIC

## provides

## wide capacity range

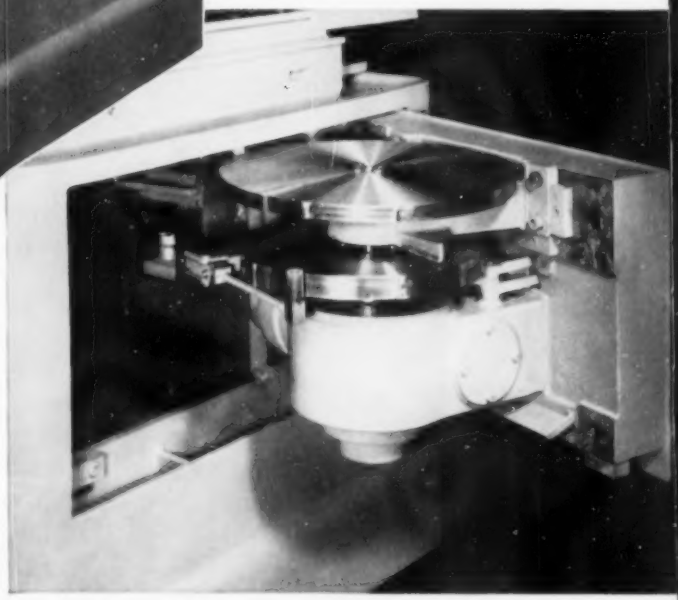
for small to medium work




Heald Model 2215
Cam Operated Bore-Matic

| | |
|---|---|
| Table Stroke | 9" |
| Boring Stroke | 5" |
| Table Pad | 18" x 41" |
| Cross-Slide Stroke | 4" |
| Cross-Slide Table Pad | 13½" x 22½" |

Entire cam unit and drive swings out on hinged panel for easy access. Locating pads on panel and base assure positive location of cams at all times. Wipers clean cam surfaces just prior to contact point of cam and follower at which point continuous lubrication is applied.



THIS new addition to the Heald line is designed for continuous, high-production Borizing of work where cam type operation and control are desirable. Table and cross-slide feeds are controlled by separate cams located in the machine base, each cam being so contoured as to provide the desired cycle. The cross-slide cam can also be arranged to operate cross-feed units or feed-out quills. By appropriate design of table and cross-feed cams, any combination of straight, taper or contour boring, turning, facing or grooving operations can be performed. For complete information, send for a copy of Bulletin 2-2215.

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HEALD

COVER: Pull reaming, in which a hollow-bodied reamer is pulled through a rotating tube, has virtually eliminated bore runout problems in cannon barrel manufacture. Details are given in an article beginning on page 91.




# The Tool Engineer

Volume XXXIX, No. 3 September 1957

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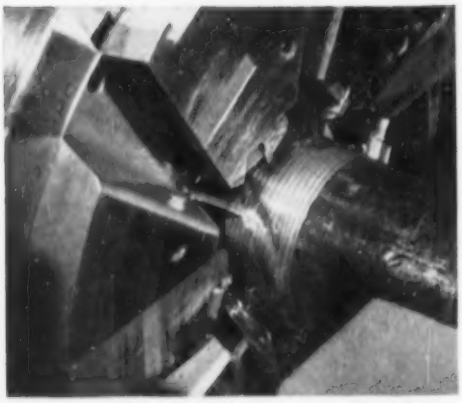

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## Using Common Language

Common language is a requisite to understanding and is useful in overcoming prejudices of others. It is especially helpful in influencing others in decisions regarding engineering information. Too often engineers use their specialized jargon, impressing many people with the thought that they are deliberately trying to confuse. Often, the charge of professional secrecy is made against the engineer who uses language unfamiliar to others. Seldom, however, is it his intent to confuse or confound. He has merely become careless in his anxiety to "sell" his findings and favorably influence others.

For instance, stastical quality control methods are successful in plants like the Hoover Co. because engineering jargon is carefully kept within the quality control department. Operators and shop personnel, however, are well informed as to quality of production. Simple bar charts replace complicated charts and calculations. There is no question about interpretation. Everybody understands because a common language is employed. There is no distrust and feeling that the engineer is living in a world unto himself.

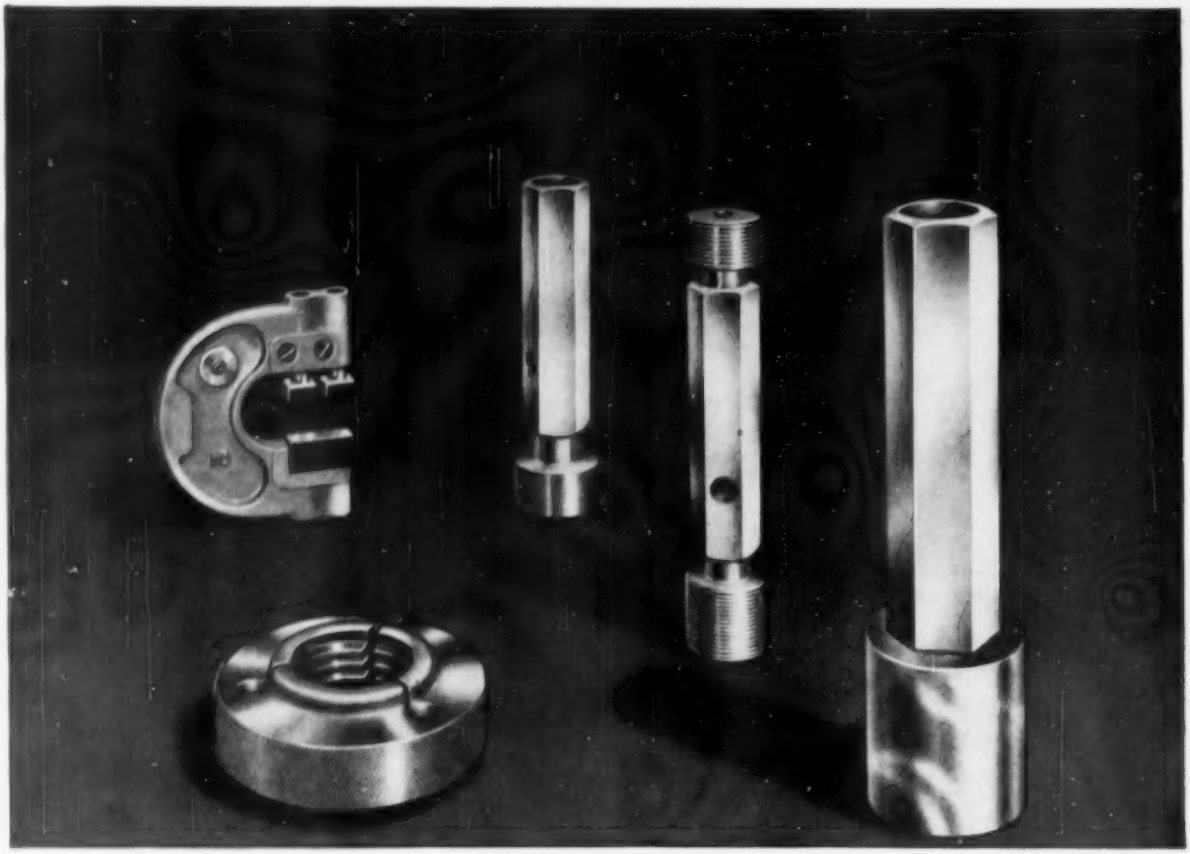
Language is a tool for all professions. It is the basic common denominator of communications. Time spent in mastering its effective use is as important as engineering proficiency because development and progress are dependent upon recorded engineering information.

The engineer's problems mean little to others. What their solutions will accomplish in terms of saving money, eliminating work, reducing production time, or making life more enjoyable is of vital interest to everyone affected. It is important therefore that he use the common language effectively and convincingly so that his recommendations receive consideration and earn the confidence they deserve.

John W Greve

EDITOR

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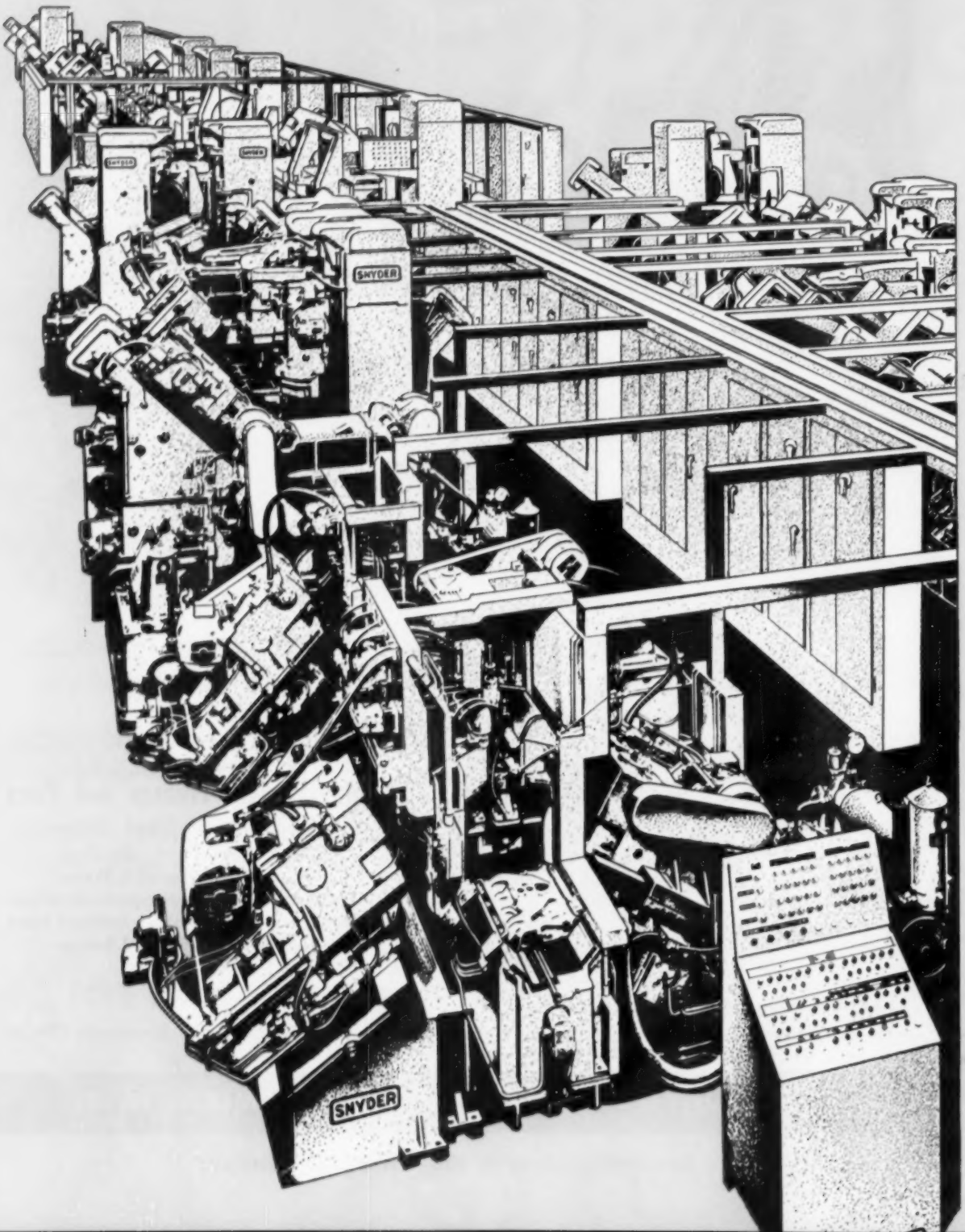


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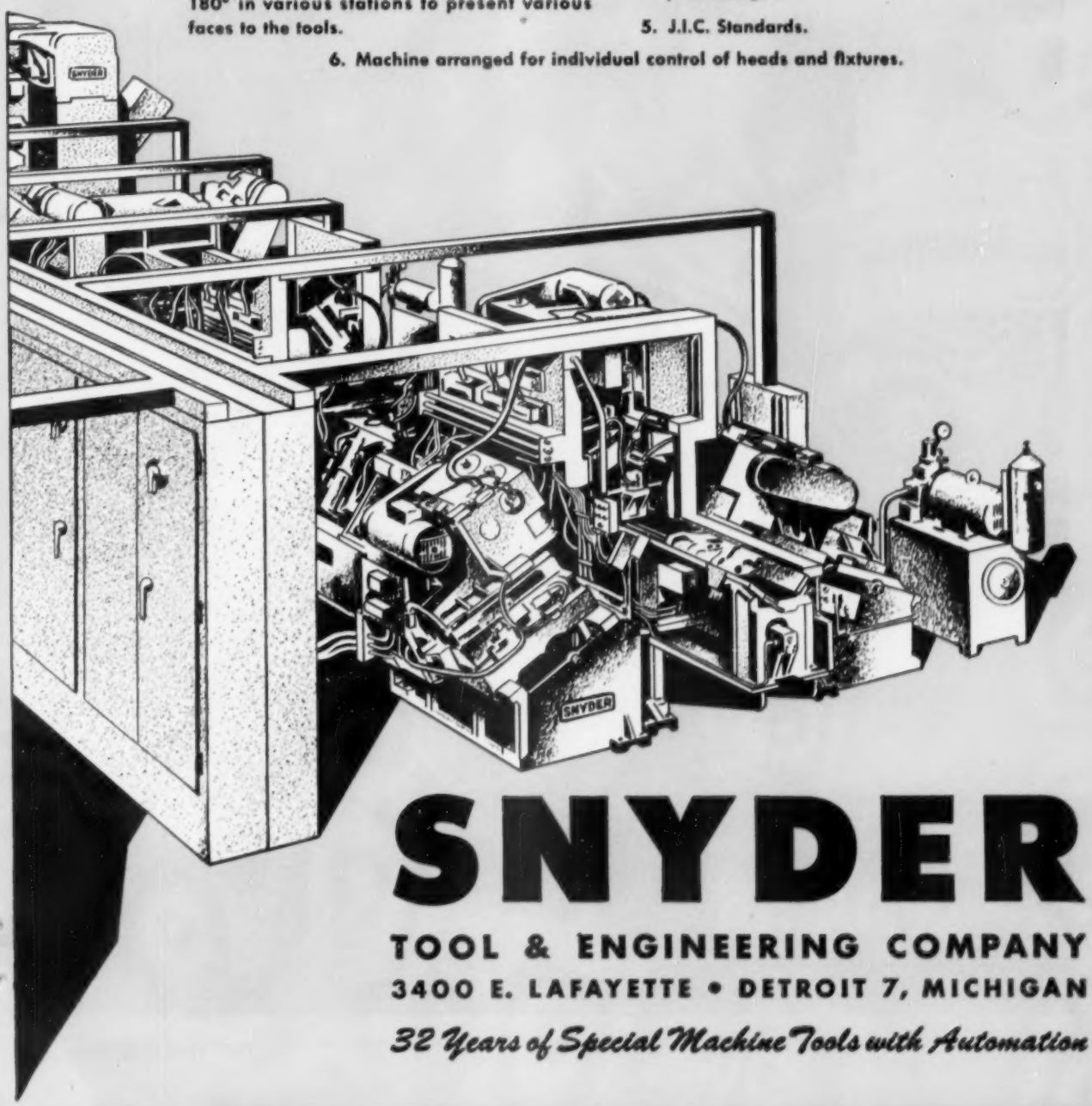


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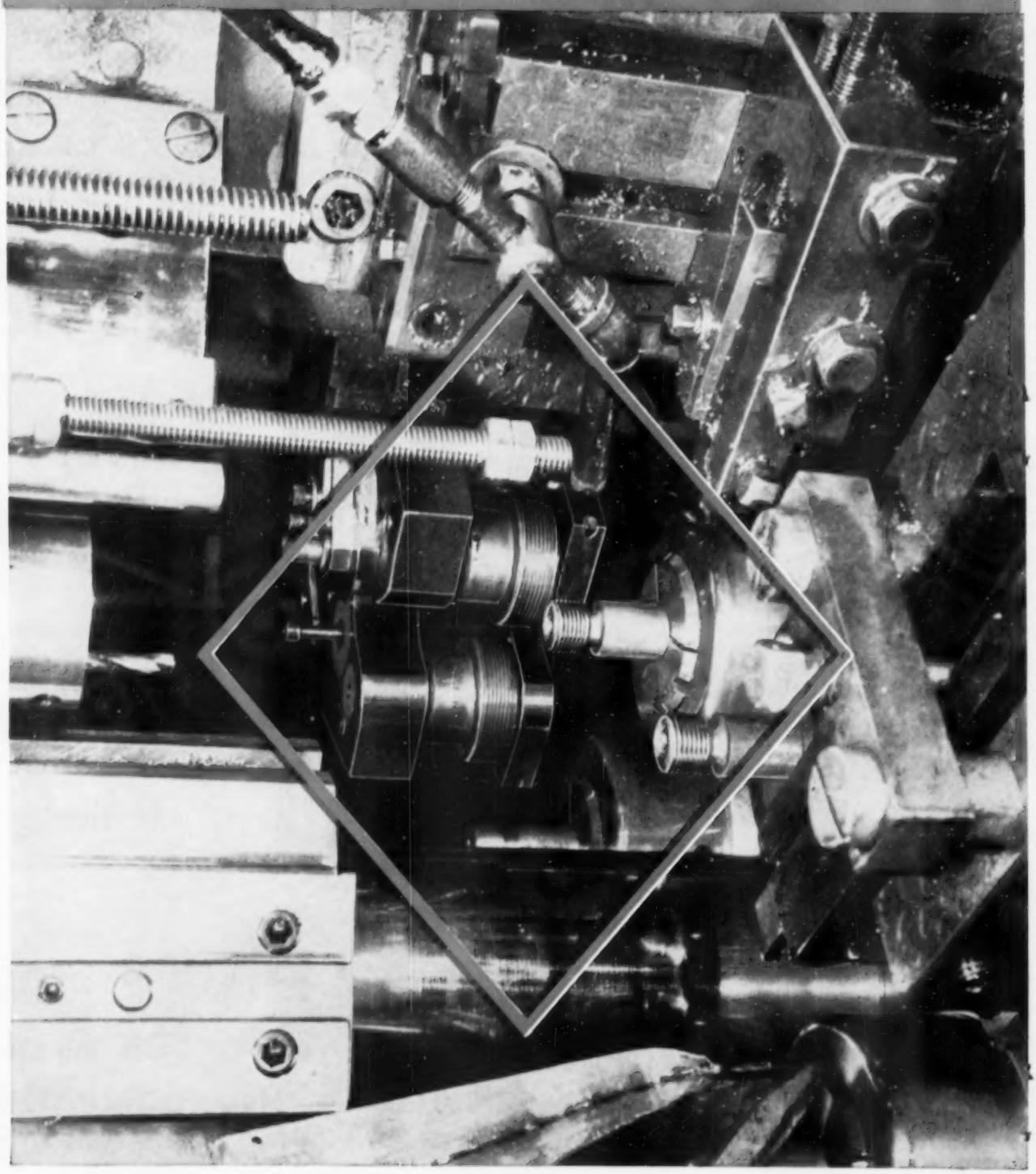

# SNYDER

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# 1/2" taper pipe thread



# rolled with the LANROLL attachment

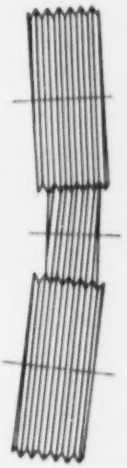
The recently developed LANDIS Method for precision rolling of taper pipe threads is shown at the Mac-It Parts Company, Lancaster, Pennsylvania, in the production of pipe plugs.

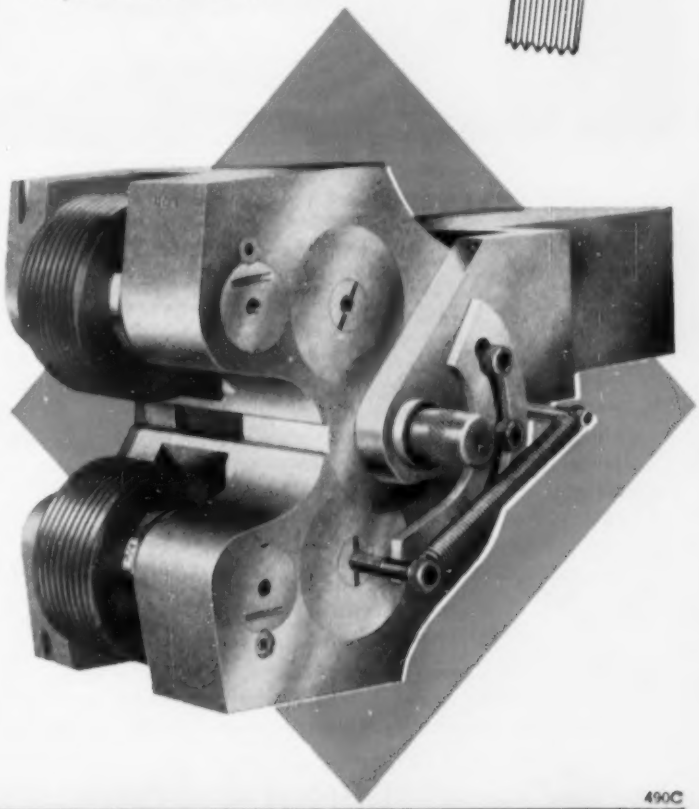
1/2" 14 pitch American Standard Taper Pipe threads are being rolled 9/16" long to dry seal specifications on 4140 steel (207 Brinnell). The #22GA LANROLL Attachment (with a pipe range of 1/8" to 1") is used in the third position on a National Acme Bar Automatic —45,000 pieces are threaded with each set of rolls.

To produce the taper, the rolls of the LANROLL Attachment are supported on carbide shafts inclined to the required thread taper. This design enables the use of parallel rolls (see diagram) which reduces slippage between the workpiece and rolls. With reduced slippage, roll life is materially increased. In addition, attachment stabilization (limited sidewise movement) is greatly improved to permit rolling directly to a shoulder with safety.

A highly desirable design feature of the LANROLL Attachment is the ability to remove the attachment from the shank by simply withdrawing the shank pin. By this means, machine tooling changes or attachment servicing can be accomplished without disturbing the original set up. This same construction facilitates, through the use of a gage, a precision, safe means for locating the attachment on the tool slide in respect to the high point of the machine's feed cam. Also, it allows attachment tipping to avoid indexing interference on screw machines having a limited tool slide movement. The same LANROLL Attachment will produce either straight or taper threads by using the proper rolls and an important but limited amount of auxiliary equipment. They provide wide range coverage while retaining the rigidity of a non-adjustable tool—assuring operation for every size within its range as though it were exclusively engineered for the particular work being threaded.

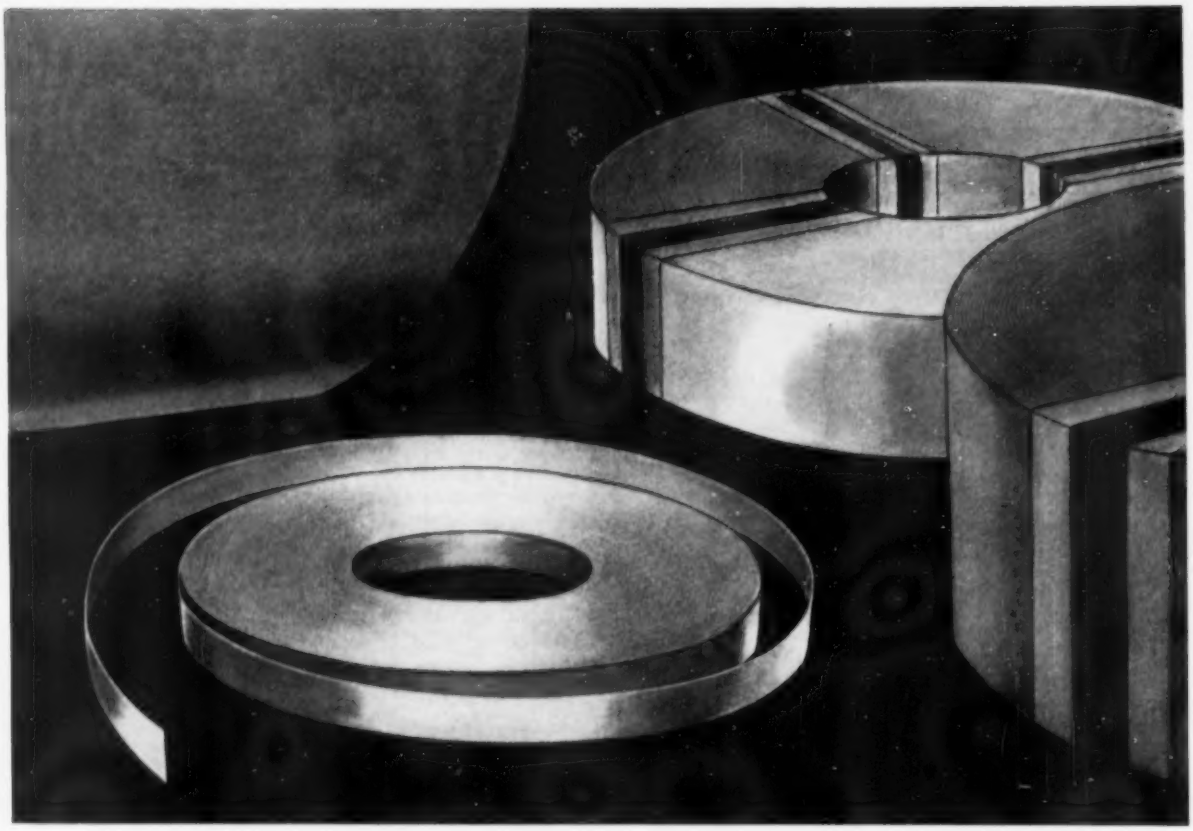
For complete information on the LANDIS Method of rolling taper threads and other outstanding design principles, please write and request Bulletin G-96.





490C

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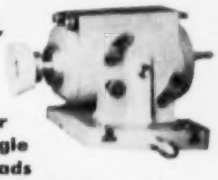
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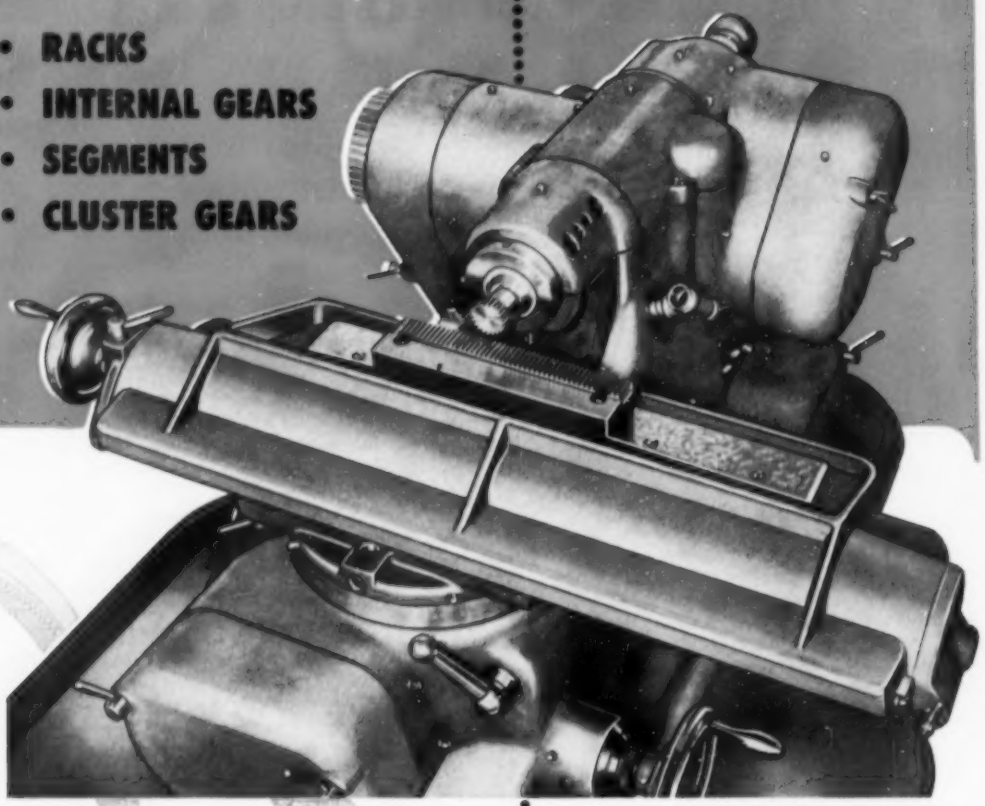
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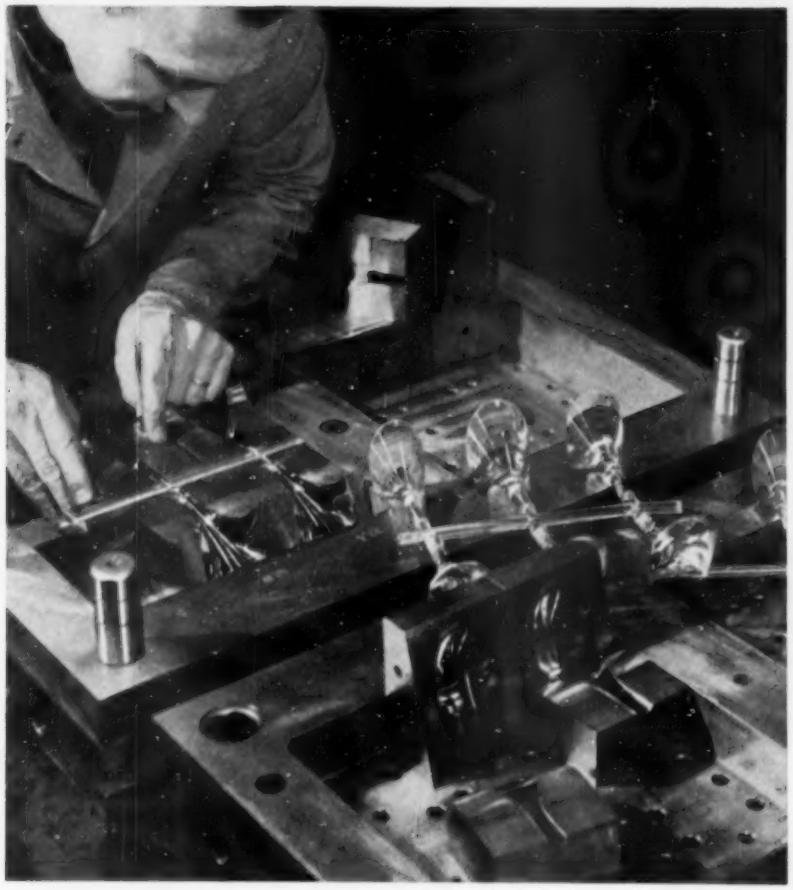
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Lustre-Die is an ideal steel for making plastic parts because its properties enable it to take an unbelievably bright mirror-like polish. Not only is Lustre-Die the proper basic analysis for working with plastics—we further enhance it by alloy fortification. It is heat-treated by oil-quenching and tempering to augment its properties, and comes ready for machining and polishing.

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Lustre-Die tool steel is worth looking into. For full details, check with your friendly Bethlehem tool steel distributor.

## BETHLEHEM TOOL STEEL ENGINEER SAYS:



*Follow These Hints When Drilling Small Diameter Holes*

Drilling small diameter (1/16 in. and less) holes when making tools is an operation which often causes considerable trouble. Breakage of drills in partly drilled holes occurs frequently, leading to the suspicion that the tool contains "hard spots." Investigation of such complaints by cutting up the suspected tool practically never confirms the presence of hard spots in modern high-quality tool steels.

Trouble in drilling small diameter holes is nearly always mechanical in nature, and is usually due to too low a drill speed, or too great a feed, or both. In order to obtain the normal speed (surface feet per minute) for cutting edges, it is necessary to run small diameter drills at high speeds in comparison to large drills. A 1/16-in. diameter drill should turn at approximately 2000 rpm, for example, as compared to about 200 rpm for a 1/2-in. drill. Proper feeds for small drills are in the order of .001 in. to .002 in., as compared to about .008 in. to .012 in. for larger drills. Overfeeding and deep cuts produce longitudinal deflection or bending of the drill, which cause overloads resulting in drill breakage. Proper planning and maintenance of correct speeds and feeds will largely eliminate trouble encountered in drilling small diameter holes.



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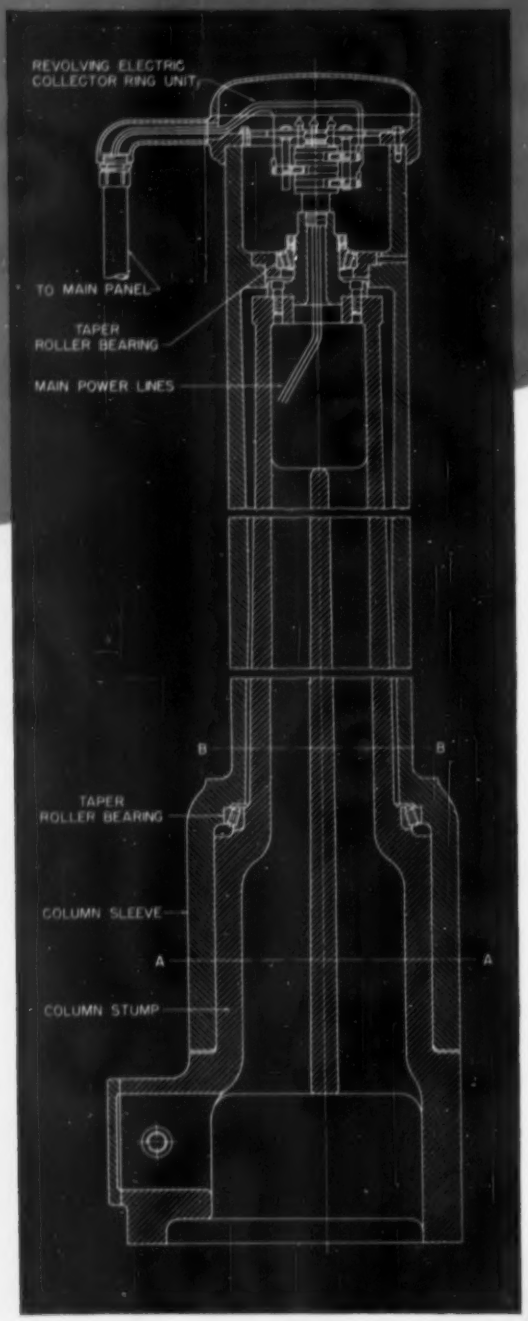
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# Rigidity Increased 50%




*New thrust resistant, "TIMKEN" mounted column and sleeve assembly.*

The new "TIMKEN" mounting of the column and sleeve on the new model 32-speed Hole Wizard Radial has hit the "jack-pot" for rigidity. It's the stiffest, most resistant column unit we've ever known.

Under drilling tests up to 30 horse power deflection has been cut in half over former models. It's truly a marvel of rigidity.

Large Timken bearings at top and bottom when preloaded bind the column and sleeve into the equivalent of a solid unit for resisting functional stresses and cuts arm deflection to an absolute minimum. This definitely results in greater accuracy and longer cutting tool life. To further increase resistance to stresses the column sleeve departs from conventional design by employing a tapered inner wall providing an unusually heavy section where the greatest functional stresses are concentrated.

A new "NON-CREEP" clamping mechanism in combination with a solid column sleeve cuff adds greatly to the rigidity of this new "AMERICAN" Radial.



*Write for Bulletin No. 328* for the complete story of More and Better Work at Lower Cost.

**THE AMERICAN TOOL WORKS CO.** Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

# Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS



*Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.*

## NEW SIZING CONTROL AT SUPERIOR STEEL PRODUCTS CORP. CUTS COSTS

**Production setup Superfinishes die-set guide pins to ± .0001"**

Here's how Superior Steel Products Corporation, Milwaukee, Wisconsin, uses Superfinish to maintain ideal clearances on die-set guide pins from 6" to 18" long and ¾" to 2½" in diameter. For close-tolerance finishing of cylindrical surfaces, you'll want a closer look at this new automatic size control unit for Gisholt 51A and 52A General-Purpose Superfinishers.

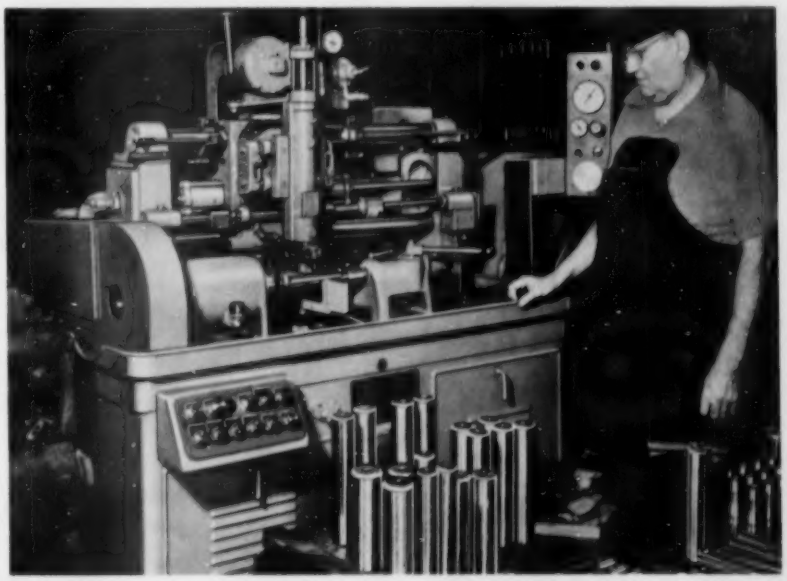
Mounted on a standard Gisholt 51A General-Purpose Superfinisher, this new unit has a U-shaped head with two adjustable jet cartridges, set .0015" from the work, which rotates between without making contact.

Operation is fast and simple. The operator places the work between centers and starts the Superfinishing cycle. As the Superfinishing stone quill descends, the size control head is raised under the part to operating position. Ordinarily, the Superfinisher has a rough and finish cycle preset by electric timers. The size control head replaces the roughing timer so that the length of the roughing cycle is automatically determined by the amount of stock to be removed.

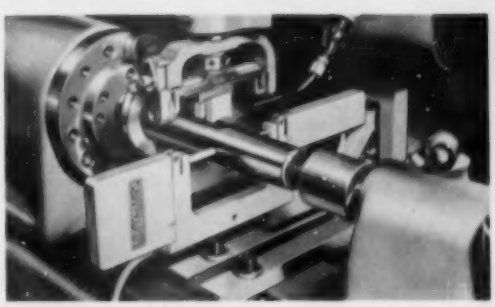
When the desired dimension is reached, the size control initiates an electrical connection, increasing the spindle speed and starting the finishing cycle which is controlled by the standard timer. Enough stock is removed during the roughing cycle to bring the part within the required tolerance; and the standard finishing cycle is still used to give the desired low micro-inch surface finish. As the Superfinishing cycle ends, the stone quill retracts and the size control head descends, thus clearing the part for unloading.

In the setup shown, Superior Steel is Superfinishing a guide pin 8" long and 1½" in diameter in 50 seconds f.t.f. time. The hardened parts come to the machine from .0002" to .0012" above the mean dimension, and are Superfinished to a controlled surface finish of 2 to 3 micro-inches and sized within .0002" of each other. 300 to 350 pins are Superfinished before the stone must be replaced.

***Superfinish reduces possibility of scoring, offers smoother operation. Many hours can be saved by Superfinishing parts within .0002" of each other on a production basis using low-cost, general-purpose Superfinishers equipped with size control units.***



51A Superfinisher, with size control unit to Superfinish hardened die-set guide pins within 2 to 3 micro-inches RMS, and holding size within ± .0001" of each other. Several part sizes handled are shown in foreground.



Size control head on 51A Superfinisher, set up for 8"-long, 1½"-diameter guide pin. Variety of parts is handled, with tooling changed several times daily. Change-over time is 5 min. or less.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

# CUT UNIT COSTS WITH

## HOW PRATT & WHITNEY USES JETracer ON TRICKY JET ENGINE PART

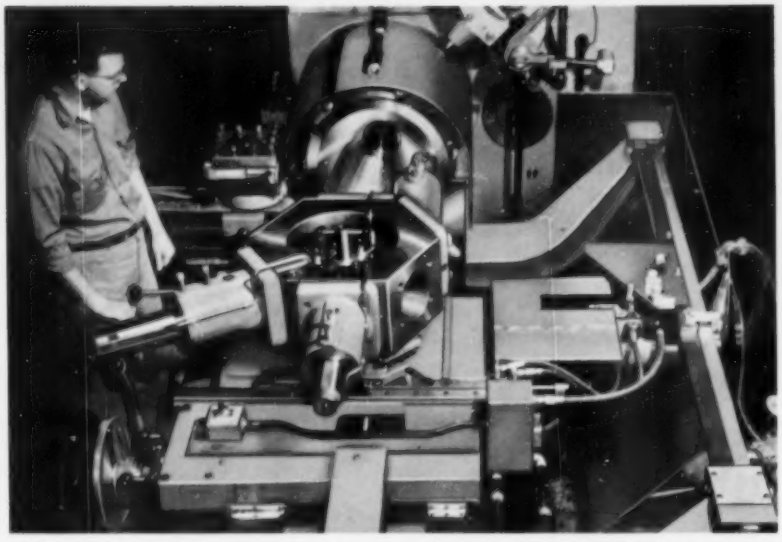
**Machines bell-shaped end of special-alloy part with speed and precision**

If you're producing parts requiring contour boring or turning operations, perhaps you can use this arrangement to reduce tooling costs and cut your set-up time.

Here's how Pratt & Whitney Aircraft's North Haven, Connecticut, plant is machining the bell end of a special-alloy rear compressor rotor for jet engines. A Gisholt MASTERLINE 4L Saddle Type Turret Lathe is used, equipped with a cross-feeding turret JETracer control with 8" of transverse travel. A bonnet-type fixture holds the long workpiece, providing ample rigidity. Setscrews grip on the large O.D., centralizing the work and dampening vibrations to provide a smoother finish.

The JETracer governs transverse movement of the cross-feeding turret as the stylus follows a flat template, which is mounted at the rear of the turret carriage.

Standard front square turret and hexagon turret tools finish a 19⅝" flange and rough-out a part of the small bore at the base of the cone. The 12"-deep cone angle is generated—and the small base bore contoured by a tool in a special offset flanged holder on the JETracer-controlled, cross-feeding hexagon turret. Concentricity between flange O.D. and the cone base diameter is held within .001". Floor-to-floor time on this difficult part is held to only 45 minutes.

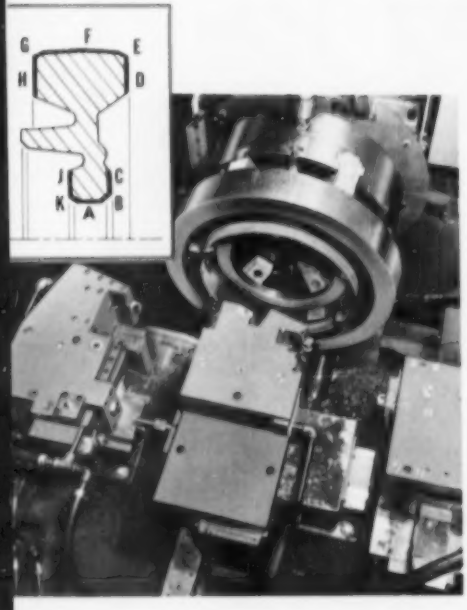


JETracer control for cross-feeding hexagon turret is at rear, away from chips. Template has dial indicator and locating blocks for transverse and longitudinal adjustment.

***JETracer-controlled, cross-feeding hexagon turret gives added flexibility for fast, accurate internal boring operations. Handles long or short workpieces anywhere along length of bed. Depth limited only by length of boring bar and runout tolerance of part.***

## SETUP ELIMINATES OPERATION IN MACHINING 27" FLYWHEELS

**Simplimatic setup completes maximum number of surfaces in single chucking, assuring parallelism and concentricity**




◀ Overhead view showing workpiece, method of chucking, surfaces machined and tooling. Note pivoting tool relief on front slide at left end, and cam-operated auxiliary slide in tool block at far right.

This setup may be just what you want to cut unit costs. By taking advantage of the Simplimatic's versatility, this manufacturer is machining 27"-diameter cast iron flywheels in just 7.5 minutes f.t.f.

Here's how it's done: The operator positions the part with an overhead crane. Located on the web against jacks on the 24", three-jaw scroll chuck face, the flywheels are gripped through three cast openings using a power chuck wrench. The Simplimatic's platen table traverses tools to the work, changes to feed, and finishes bore A with three tools on the center slide. Spindle speed is 90 r.p.m.

When the bore is finished, a two-speed motor reduces spindle speed to 45 r.p.m. All slides operate simultaneously. Four tools on the front slide straddle-face D-H and chamfer E-G. The front facing tool block pivots for tool relief. Tools on a cam-controlled auxiliary slide on the rear slide contour-turn F, leaving the center .023" high with a ⅛" radius at the high point. The turning tool is relieved at the end of the cut. Center slide tools feed transversely, straddle-facing C-J and chamfering B-K to complete the part.

***Simplimatic's flat platen table permits positioning independent slides for maximum tool support and effectiveness. Two-speed motor provides desired finish; table feed saves additional handling or special tooling for boring operation.***

GISHOLT

*LOOK AHEAD... KEEP AHEAD... WITH GISHOLT*

GISHOLT

TIME-SAVING IDEAS

## NATIONAL CASH REGISTER CUTS TIME MACHINING UNUSUAL PART

**Combines well-planned tooling with JETracer on Gisholt Ram Type Turret Lathe to reduce floor-to-floor-time**

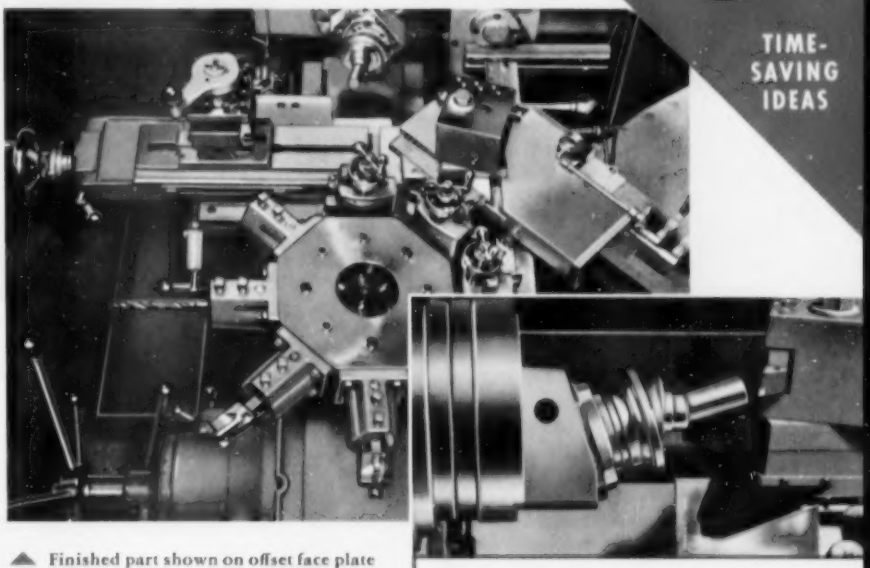
This setup shows how National Cash Register Company, Dayton, Ohio, is machining a steel motor wobbler drive shaft forging—using the versatile Gisholt JETracer on the MASTER-LINE No. 5 Ram Type Turret Lathe.

The part actually has two center lines. It is held parallel to the spindle center line during the first three operations, then held on an offset fixture to machine several eccentric diameters to high accuracy in the final operation.

The large flange is machined in the first operation. All internal diameters—plus five diameters in section A—are handled in the second operation.

For the third operation, the work is chucked on the large end, locating against the back of the large flange. The long shaft and the concentric diameters in section B are finished, using the JETracer and tools on the octagon and front square turrets.

To finish the eccentric diameters, a special expanding mandrel on an offset face plate fixture supports and locates the work in the previously machined I.D. Front tool post tools rough, and the JETracer on the rear of the cross slide finish contour-turns this section. Floor-to-floor-time is thus held to an impressive 2.85 minutes.



▲ Finished part shown on offset face plate fixture. Note octagon turret. JETracer on rear of cross slide does not hinder use of standard tools.

(Inset) Workpiece on special offset fixture with template in foreground.

L. to R.: Workpiece after first operation, showing amount of stock to be removed; finished part, with both center lines indicated and eccentric surfaces outlined; sectioned workpiece showing internal surfaces. ▶

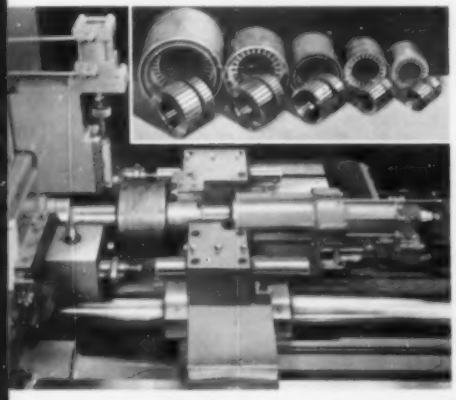



***JETracer saves time, assures accuracy, eliminates human error. Only one tool on octagon turret is replaced during the four operations. Square turret tools are changed as needed.***

## VALLEY ELECTRIC LOWERS COSTS IN MOTOR FRAME MANUFACTURING

**Handles both ends in single chucking on No. 12 Automatic using special auxiliary slides**

Bushings and spacers for expanding mandrels speed change-over. Spacers added when bore diameter remains the same, bushings added when bore diameter changes. ▼



You may see the way to more parts per hour by studying this setup at Valley Electric Corp., St. Louis, Missouri. Here, the No. 12 Automatic Production Lathe is handling 18 sizes of electric motor frames—both cast iron and steel—boring or turning rabbet fits on three different types of work pieces.

Let's look at the machining cycle on a typical frame. Slipped on an air-operated expanding mandrel, located against an air-operated automatic retracting locator on the headstock, the work is chucked in the I.D. and supported on the right end by an arbor.

◀ Headstock-mounted front and rear auxiliary slides are operated by forward movement of standard front carriage and rear independent slide.

The locator retracts to clear the part and the cycle begins.

To machine the motor frame simultaneously at both ends, special headstock-mounted auxiliary slides are used, operated by forward movement of the front carriage and rear independent slide. Facing, rough-turning and chamfering are handled from the rear independent and rear auxiliary slides, while the front carriage and front auxiliary slides finish bore and chamfer. F.t.f. times range from less than one minute on the smallest part to three minutes on the largest part handled.

***Inner rabbet fits are machined on parts from 7½" to 10⅛" O.D. and 2½" to 6" wide, and outer rabbet fits are machined on parts from 6½" to 12¾" O.D., and from 4¾" to 10" wide.***



GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

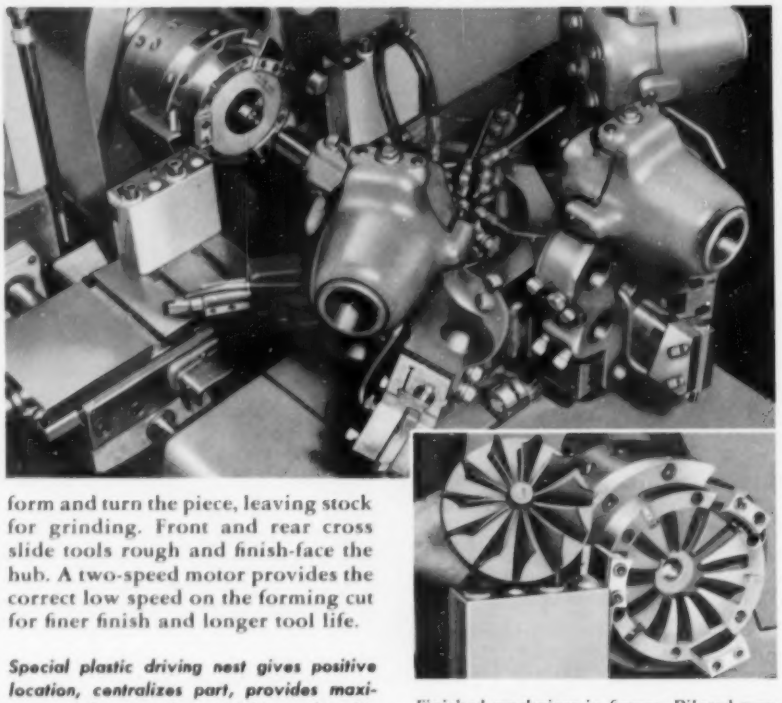
## CUMMINS ENGINE CO., INC. MACHINES STELLITE PART 25% FASTER

**Uses the 1F Fastermatic with special chucking fixture to simplify turbine wheel machining.**

This turbine wheel casting, used in Cummins Turbojet Diesels, is made from Haynes Stellite No. 31—an exceptionally hard material offering high resistance to heat and oxidation. To get the accuracy required and handle a heavy forming cut on the hub radius, the part has to be driven from the back side with very rigid support. The vanes make standard chucking methods impractical. Here is how Cummins Engine Co., Inc., Columbus, Indiana, machines this part accurately in only 12 minutes f.t.f., 25% less than the 16 minutes required previously.

A special air-operated fixture holds the work in a molded plastic driving nest, formed to fit the contour of the turbine wheel and vanes. The 5⅞"-diameter, 2⅞"-deep part is accurately located and centralized in this driving nest, and clamped on the outer face with three drawback fingers. Hexagon turret tools drill, bore, face, form and turn the piece, leaving stock for grinding. Front and rear cross slide tools rough and finish-face the hub. A two-speed motor provides the correct low speed on the forming cut for finer finish and longer tool life.

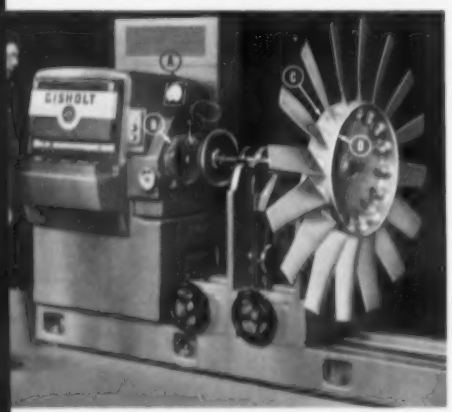
***Special plastic driving nest gives positive location, centralizes part, provides maximum rigidity. Tough material is machined in less time through Fastermatic's smooth hydraulic feed, with tools reground only once for each eight-hour shift.***



Finished workpiece in fixture. Piloted turning heads give maximum tool support. (Inset) Accurate location and rigid support provided by plastic driving nest which holds turbine wheel (in hand).

## HOW JOY MFG. BALANCES FANS MORE ACCURATELY, FASTER, CHEAPER

**Handles large fan rotor assemblies in overhang position on 2U Balancer, obtaining two-plane balancing**




Workpiece rotated on balancing arbor outside the work supports. Correction made at C and D. (Shrouding, which reduces air turbulence, removed for photo.)

You'll get ideas from this balancing job—it shows how Joy Manufacturing Co., New Philadelphia, Ohio, has improved accuracy and reduced balancing costs. They are using a new Gisholt 2U Balancer to handle large axial flow fan rotor assemblies up to 66" diameter and weighing 40 to 105 pounds.

Since the large-diameter workpieces do not have their own shafts, a mounting arbor is placed between the work supports with a full bearing and a counterweight on the left support, to keep the center of gravity between the supports and prevent "lift" during work rotation. The parts are simply slipped on the arbor end and balanced in the overhang.

Operation is simple: The part is loaded and rotated at balancing speed. The amount of unbalance in each correction plane is read on the direct reading amount meter (A), which indicates unbalance in terms of the correction method being used. Although the correction planes are only 1¾" apart, unbalance cross effects are eliminated by the balancer's electrical networks and do not affect machine accuracy. Angle of unbalance is clearly indicated on dial (B). Correction is by adding weight at both edges of the turbine blade mounting rim at the indicated angles.

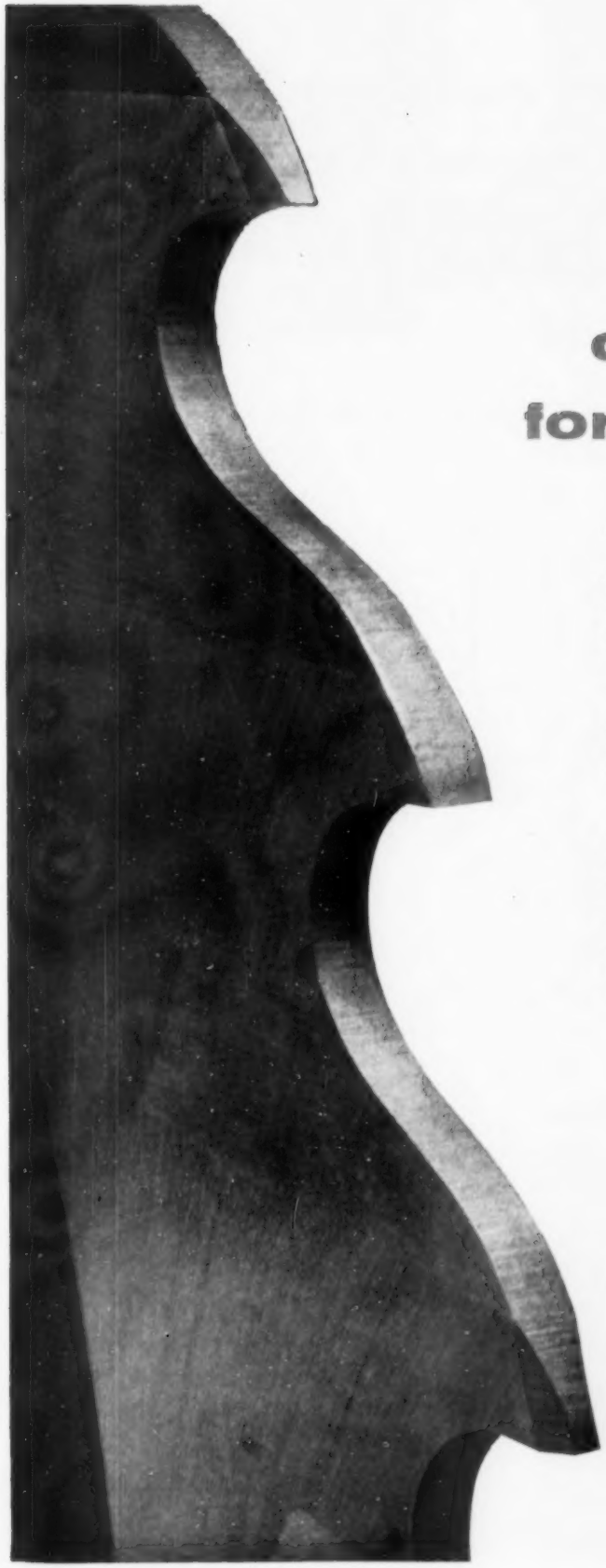
***Close balancing tolerances are easily held. The new Type U Balancer provides ample swing (68") for largest parts with no decrease in accuracy whether balancing operations are performed with the work between or outside of the standard work supports.***

No. 9-1057
688

**THE GISHOLT ROUND TABLE** represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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Your local M&M dealer stocks the complete line of M&M cutting tools and is always at your service to help solve tough or unusual sawing problems. Call him today.

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S *Service*
A *Availability*

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Cutting Tool Manufacturing Division
Cleveland 17, Ohio



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# "we achieved 400% increase in production!"*

## This impressive benefit is the result of converting to LAPOINTE —BROACHING

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**Any way you look at it,** an increase of 400% in production is mighty good business . . . whether you are Lapointe-Broaching a heavy part similar to this one, or some other item that may also be required in large quantities.

**72 parts per hour** (at 80% efficiency) became the new production rate after this job was converted to Lapointe-Broaching. That's because this machine is *fast*, one operator easily handling the complete broaching operation, loading one ram while the other ram is broaching.

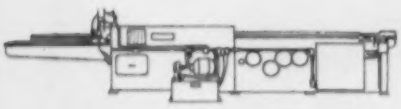
**You should investigate Lapointe-Broaching.** You may be agreeably surprised at some of the cost-reduction possibilities that can be had in your own plant through a comparable conversion. A qualified Lapointe Field Engineer will be glad to see you, on request.

**THE LAPOINTE MACHINE TOOL COMPANY**

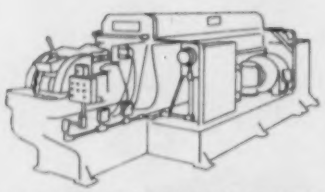
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

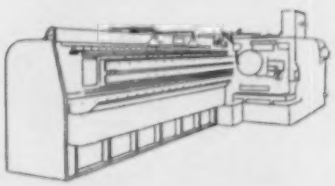
***Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE***



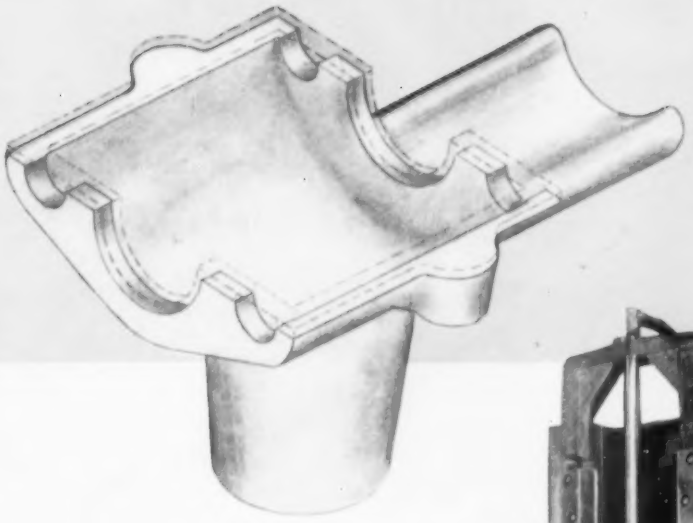
60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

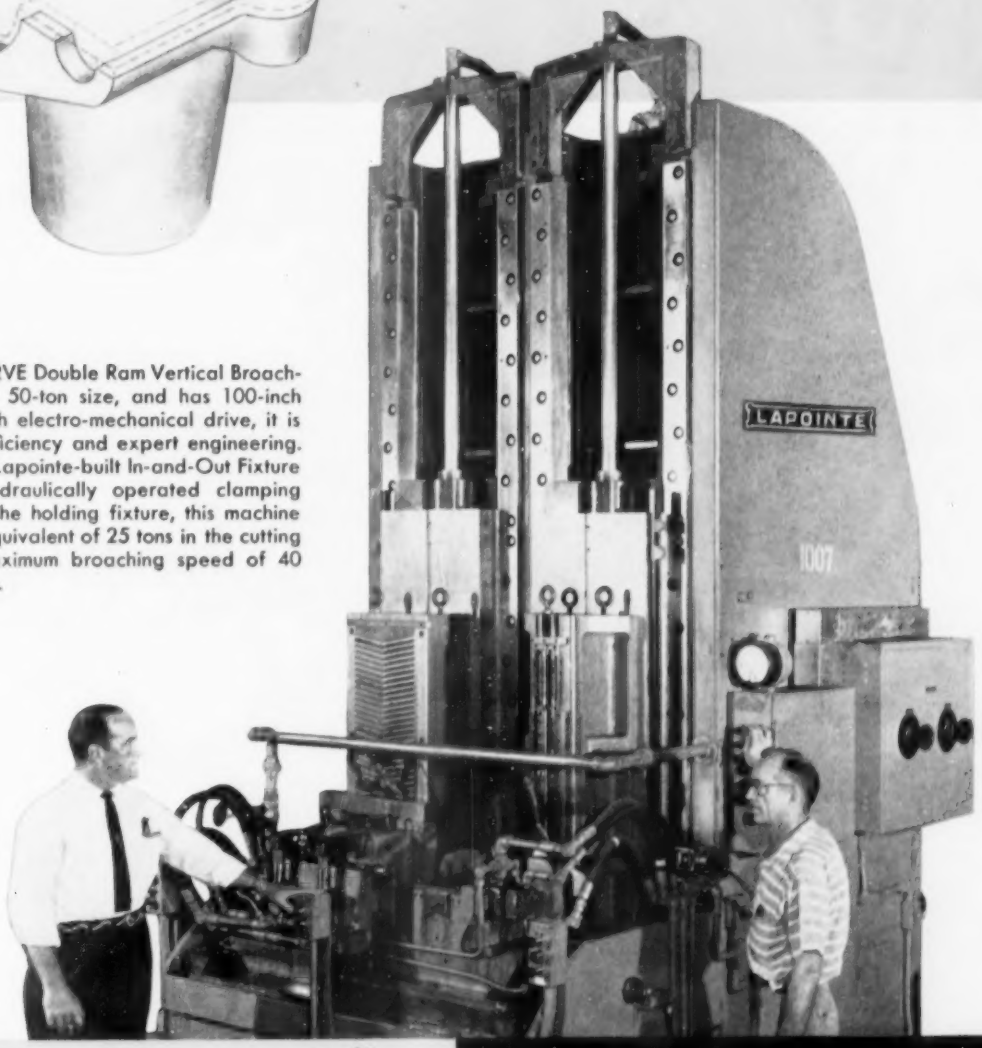


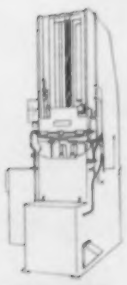
SRHE SINGLE RAM HORIZONTAL, ELECTRIC



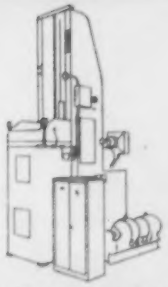
Note that one ram is set up for slab broaching, removing 1/32" per pass on a 56 sq. in. surface of this hard steel forging. The other ram broaches 3 half-rounds in one pass.

This Lapointe DRVE Double Ram Vertical Broaching Machine is 50-ton size, and has 100-inch stroke. Built with electro-mechanical drive, it is a marvel of efficiency and expert engineering. Equipped with Lapointe-built In-and-Out Fixture Table, with hydraulically operated clamping mechanism on the holding fixture, this machine develops the equivalent of 25 tons in the cutting tool at the maximum broaching speed of 40 feet-per-minute.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

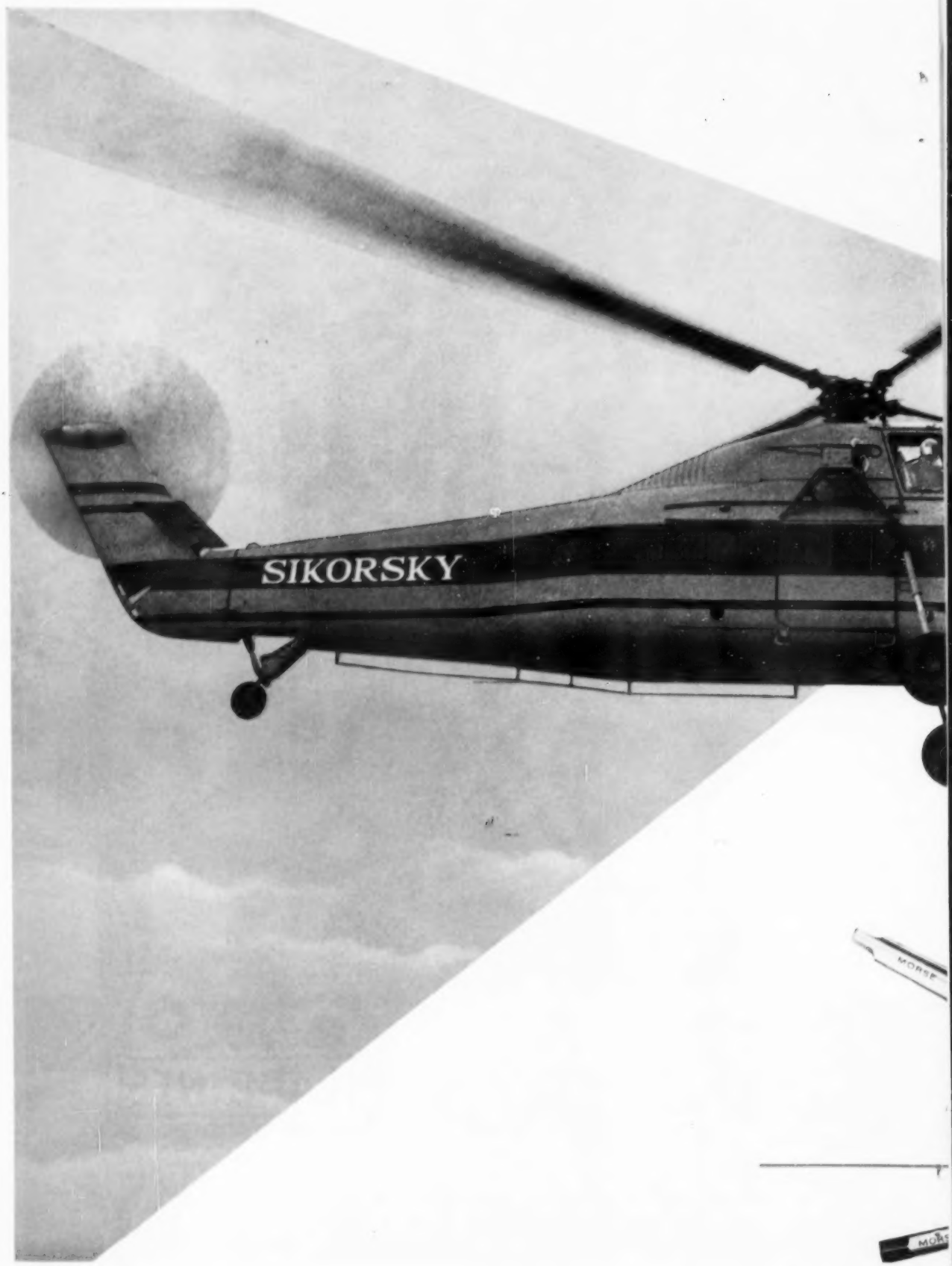
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means "THE MOST" in Cutting Tools



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## Automatic Skin Drilling Machine

To replace costly, slow hand methods, Grumman Aircraft Corporation designed and fabricated the "skin drilling machine" shown here.

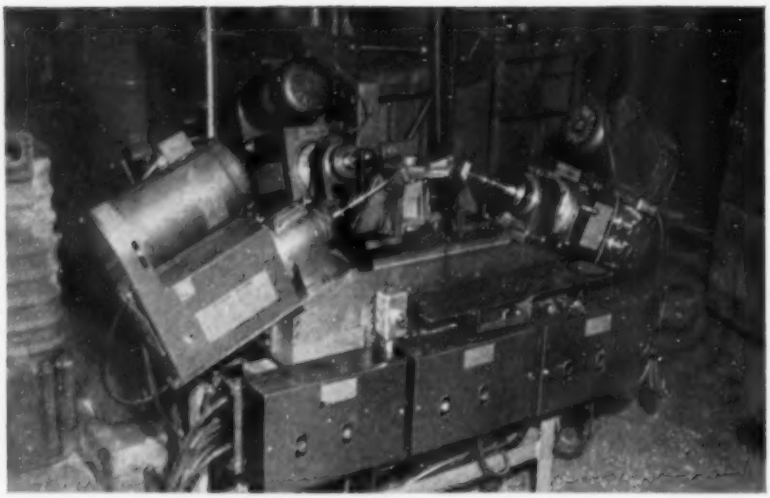
The production requirement was—9000 holes in aircraft skin assemblies consisting of aluminum corrugated section and skin. Formerly, all holes were predrilled by hand in the corrugations and then transfer drilled into the skin. Now, hand work is reduced to tack riveting skin and corrugation and for a few inaccessible areas.

### Operation

This new machine clamps the workpiece to prevent burring, drills #40 holes usually 5/8" apart and indexes automatically to next position. A chain and sprocket 1 H.P. drive, regulated by template and photo-electric controls, moves the drill head and lower ram assembly along parallel rails from hole to hole. The workpiece remains stationary. Row on row indexing is done by an air driven gear and rack assembly. 50 to 55 holes per minute, or about four hours per assembly, are now achieved.

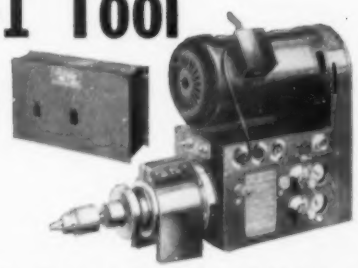
### Savings

In addition to the remarkably high time savings of 7½ hours per workpiece, other benefits include reduced jig time and number of jigs, extended drill life and the elimination of operator strain. The drill head used is a Dumore 20-011, self-contained with a rotary vane compressor. This is but one of the many automatic drill units made by Dumore for automation purposes. For complete information, write The Dumore Company, 1310 Seventeenth St., Racine, Wis.

# Drill and Tap Automatically with this 2-in-1 Tool

## the New DUMORE Series 28 "DRILL-N-TAP" UNIT



### Saves Set-Up, Fixture and Service Costs

One of the world's largest farm implement makers, Massey-Harris-Ferguson, uses three new Dumore "Drill-N-Tap" Units to cut costs and increase production on power take-off housings. These units *automatically drill and tap* three holes in two sizes of housings without changing position on the same set-up. A 1"-thick steel plate is placed under the smaller housings for aligning to proper position. Here, the drilling and tapping are done on the same fixture. Drill bushings are simply removed when tapping. *Tap fits into chuck—no extra tapping head is required!*

The Dumore "Drill-N-Tap" Unit is a *driller* and a *tapper* — all in the same automatic machine. Two tools in one — at the cost of only one!

It drills or taps without attachments — no long overhang, or expensive clutches to wear out. Self-reversing motor, electrically controlled, withdraws tap by reversing spindle rotation. You drill or tap *at the flip of a switch!*

**Mounts in 3 minutes — anywhere —** on job after job for long or short production runs. It doubles the output of ordinary methods with less tool breakage and scrap losses. Simple nose mounting device provides easy installation on less table area. Work mounts close to fixture with little tool travel for faster cycling, less idling time. 10 speeds from 265 to 4900 rpm.

**GET A DEMONSTRATION NOW. . . SEE YOUR DISTRIBUTOR, OR WRITE**

YOU CAN DO MORE WITH DUMORE DRILL UNITS
DRILLING • TAPPING • BORING • MILLING • FACING • REAMING • CHAMFERING • DEBURRING

DUMORE PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST AND
HAND GRINDERS

1310 Seventeenth St., Racine, Wis.

# Northwestern TOGGLE-SHOE CLAMPS

**THREE NEW SOCKET TYPES! KNURLED SHAFT • KNURLED HEAD • HAND KNOB**

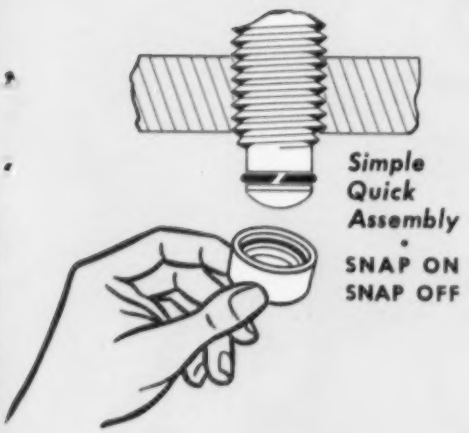
**ALL TYPES ARE INTERCHANGEABLE WITH "SNAP ON-SNAP OFF" ROUND OR V-PADS**



PATENT APPLIED FOR

**SIZES — ¼-20 to ⅝-11** **LENGTHS — 1" up to 5¼"**

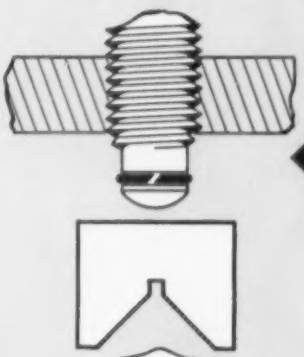
*There is a dealer near you that stocks Northwestern Tools — Write for information.*



**Simple Quick Assembly**

•

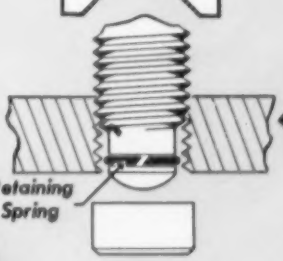
**SNAP ON SNAP OFF**



**10° ADJUSTMENT** *in all directions*



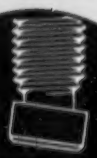
Retaining spring holds shoe in place yet allows a full 10° adjustment in all directions.



Retaining Spring

**NO INTERFERENCE**

*Shoe only 1/16 larger than bolt*

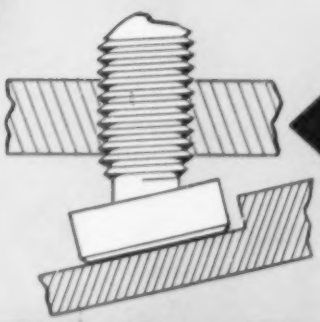


Short shoe design requires a minimum distance between fixture and the work.




**Free**

**TRACING TEMPLATE 286 ITEMS** *full Scale* • •



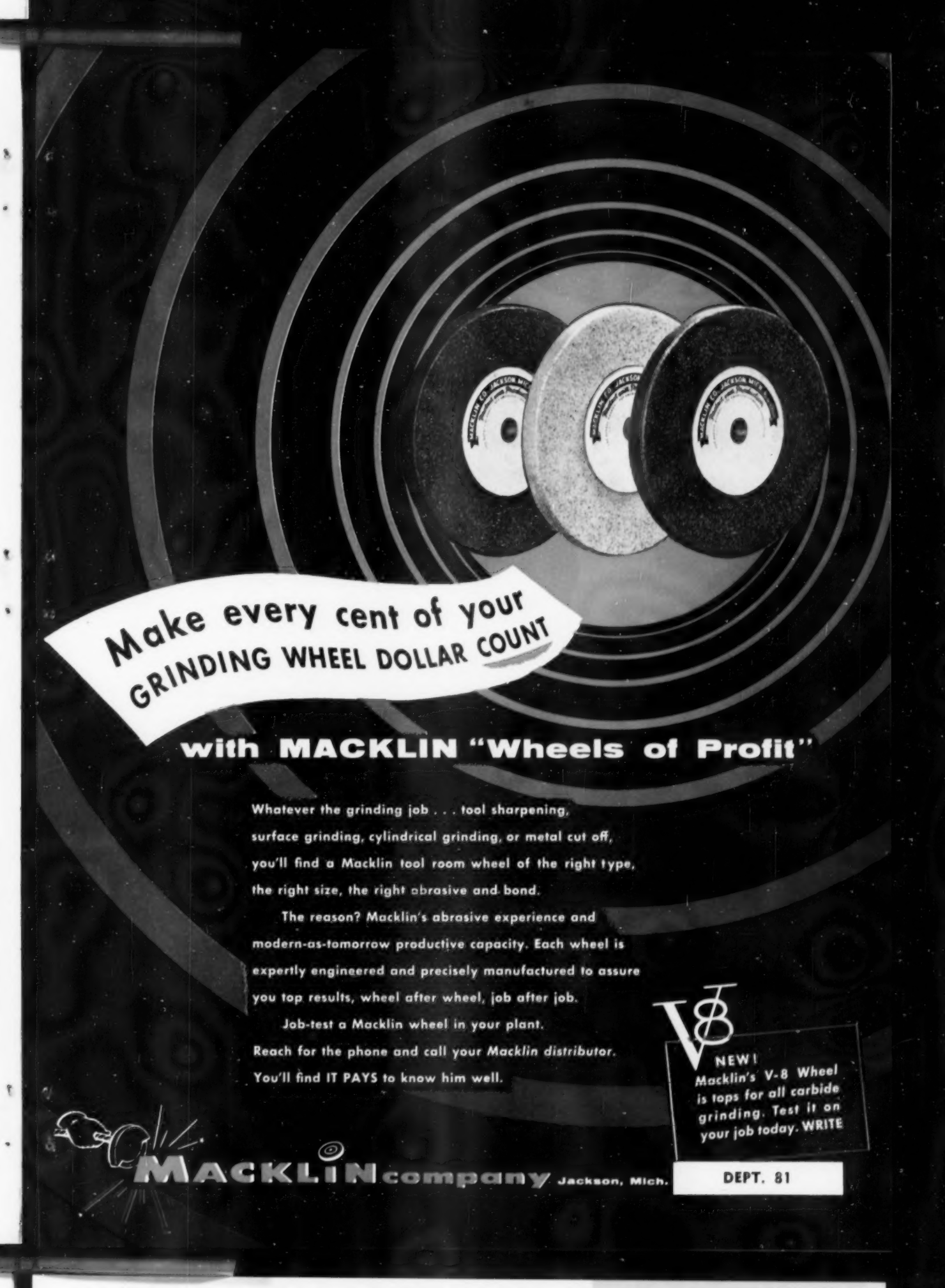
**HEAT TREATED** *for max. toughness*



Screw is heat treated for long life—shoe is heat treated to prevent marring of work.

122 HOLLIER AVE. **Northwestern** DAYTON 3, OHIO


SIX
GREENLEE'S
ON THIS TEAM
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GREENLEE
Leading Auto Manufacturer Selects
6 Greenlee Transfer Machines For
V-8 Engine Block Precision Machining Line
The entire installation has 127 stations and a machined block comes off the line at each cycle. This first unit drills and reams locating holes, mills main bearings to width; mills lock slots, oil seal and slinger grooves, fuel pump and filter pads and rough bores cylinders. It also has a gauging station to check locating holes, a reject station and three turnover stations, the last of which positions the block for the next machine.
WRITE FOR
COMPLETE INFORMATION
GREENLEE
BROS. & CO.
1989 MASON AVENUE
ROCKFORD, ILLINOIS


Make every cent of your
GRINDING WHEEL DOLLAR COUNT
with MACKLIN "Wheels of Profit"
Whatever the grinding job . . . tool sharpening, surface grinding, cylindrical grinding, or metal cut off, you'll find a Macklin tool room wheel of the right type, the right size, the right abrasive and bond.
The reason? Macklin's abrasive experience and modern-as-tomorrow productive capacity. Each wheel is expertly engineered and precisely manufactured to assure you top results, wheel after wheel, job after job.
Job-test a Macklin wheel in your plant.
Reach for the phone and call your Macklin distributor.
You'll find IT PAYS to know him well.
V-8
NEW!
Macklin's V-8 Wheel is tops for all carbide grinding. Test it on your job today. WRITE
MACKLIN company Jackson, Mich.
DEPT. 81

a




**A** **POWER OPERATED BARREL TYPE SLIDE ADJUSTMENT** facilitates and speeds die-setting. Push button operated, it's not only fast and smooth but permits micro-positioning within a thousandth of an inch.

**B** **HYDRAULIC INCLINING DEVICE** operates smoothly. The press can be inclined or brought upright in approximately 2 minutes. Operating lever and push buttons conveniently located on left panel leg.

**C** **BRAIN CENTER OF THE AUTOMATION SYSTEM,** the Rotary Limit Switch can be adjusted precisely while the press is in motion for synchronizing automation devices with press cycle.

**D** **LOW INERTIA, ELECTRO-PNEUMATIC FRICTION CLUTCH** operates directly on the crankshaft. Most of its weight continues to rotate with the main gear. Only the crankshaft and driving plate are started and stopped at each cycle. Heat and wear are reduced to an absolute minimum. Torque capacity may be changed by adjusting air pressure.

# truly revolutionary line of OBI's

## automated to hit new production highs

Never before has there been an OBI like this. In feature after feature, you'll see pulse-quickening newness that will inject speed and rhythm into your production. Outfitted with today's most advanced controls and devices, this all-new Niagara Series EA offers you automation at its very best.

Boasting a revolutionary front-to-back crankshaft design, it's streamlined in an ultra-modern, functionally sound, eye-pleasing way. In fact, it's the only totally-enclosed OBI ever made. There are no exposed, overhanging gears, flywheel or other mechanisms. With the entire driving assembly fully enclosed within the limits of the compact frame, this trim-line performer actually takes up less floor space than any press in its range and category. It's only natural that such a triumphant line of OBI's as this should parade from Niagara . . . for Niagara has been leading the way, *all of the way,* in building all types of OBI's — single crank and double crank, standard and fully automatic. Hailed as "the latest and greatest of them all," the Series EA is built in 4 sizes, with shaft diameters from 4½ to 7½ inches and capacities from 75 to 200 tons.

**FULL DETAILS ARE YOURS FOR THE ASKING:**
Write for illustrated Bulletin 56 today!

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N. Y.

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**NIAGARA**

## front-to-back crankshaft AUTOMATED INCLINABLES

**America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work**

**E** **AIR CONTROL PANEL AND HYDRAULIC INCLINING SYSTEM** are neatly housed within the left leg. Air line filter, pressure regulator, gages, blow-off valves and lubricators, as well as the hydraulic pump for the inclining system, are all concealed behind a dust-tight door.

**F** **AUTOMATIC CIRCULATING OIL SYSTEM** (left panel leg) sends metered flow of clean, filtered oil to all bearings and gears in the crown, air counterbalance and slide gibs. Correct operating oil pressure is maintained or the press stops automatically.

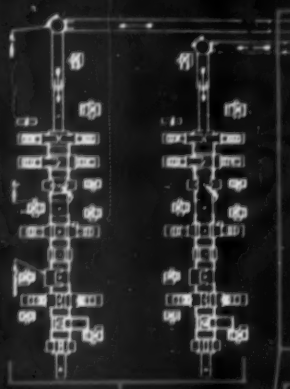
**G** **CONTROLLED AIR SUPPLY AND PNEUMATIC TIMING RELAYS** (left panel leg): Air line receptacles, synchronized with press cycle, are provided for die doper, die kicker and die lifter . . . with auxiliary receptacles for die maintenance tools. Adjustable timing relays control interval of automation functions initiated by rotary limit switch.

**H** **OPERATOR'S PANEL** (right panel leg) features deluxe operating controls conveniently arranged for fingertip direction of every press motion. Chained to safety block, safety plug de-energizes entire press control when pulled from its receptacle.

**I** **COMBINATION MOTOR AND PRESS CONTROL PANEL** fully enclosed within the right leg behind a flush-mounted, dust-and-oil-tight door, houses: disconnect switches, circuit protection, transformers, fuses for main motor and auxiliary power supply; control relays; starters for main motor, lubrication and hydraulic pumps.

**PNEUMATIC CUSHION** is automatically lubricated by self-contained pumping system; internally guided and rigidly supported by press frame.

# 1300 ft. Transfer-matic Performs 2291 Operations on V-8 Blocks



**SECTION VI**

Blocks enter with ends exposed. After tapping ends and top, they are rotated to car position for tapping banks and sides. Final position is bottom up for tapping pan rail and under banks.

**SECTION V**

Valve lifter holes are drilled, rough reamed, finish reamed and inspected.

**SECTION IV**

With blocks in car position, mounting pads are milled, cylinder head bank faces are drilled, chamfered and counterbored and deep oil holes are drilled.

**SECTION III**

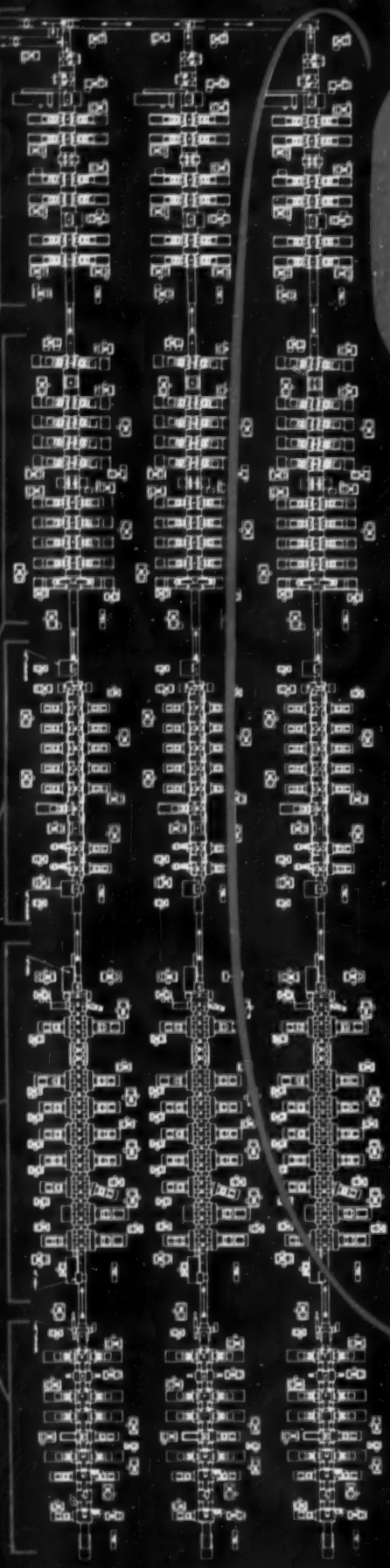
Blocks are turned on sides. Then distributor hole is rough and semi-finish bored, all holes in top are drilled and chamfered and crankshaft bearing cap holes and oil holes are drilled in bottom.

**SECTION II**

Blocks are turned 90 degrees, all holes in ends are drilled and chamfered, three oil gallery holes are pressure tested and cam shaft bearing diameters are rough bored. Then blocks are turned to car position.

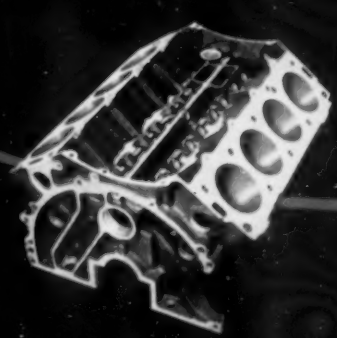
**SECTION I**

Blocks enter bottom up. Oil pan screw holes are drilled, transfer spots are machined in pan rail, under banks are drilled and chamfered and blocks are turned to car position.




Here is the answer to the automobile industry's insistent request for machine tools which will reduce the cost of model changes and shorten change-over periods. This giant "Sectionized" Transfer-matic is constructed with an entirely new set of Cross building blocks and applies new concepts of standardization to machine bases, transfers, fixtures and heads.

- ★ Capacity to machine any passenger car engine block.
- ★ 270 stations in 17 sections, each with independent controls; sections operate automatically as blocks are made available; any section may be stopped without interrupting production of others.
- ★ 2291 operations on 185 blocks simultaneously.
- ★ Rated capacity of 350 cylinder blocks per hour.
- ★ Cross Machine Control Units with Toolometers for efficient tool programming.
- ★ Pre-set tools to reduce downtime.



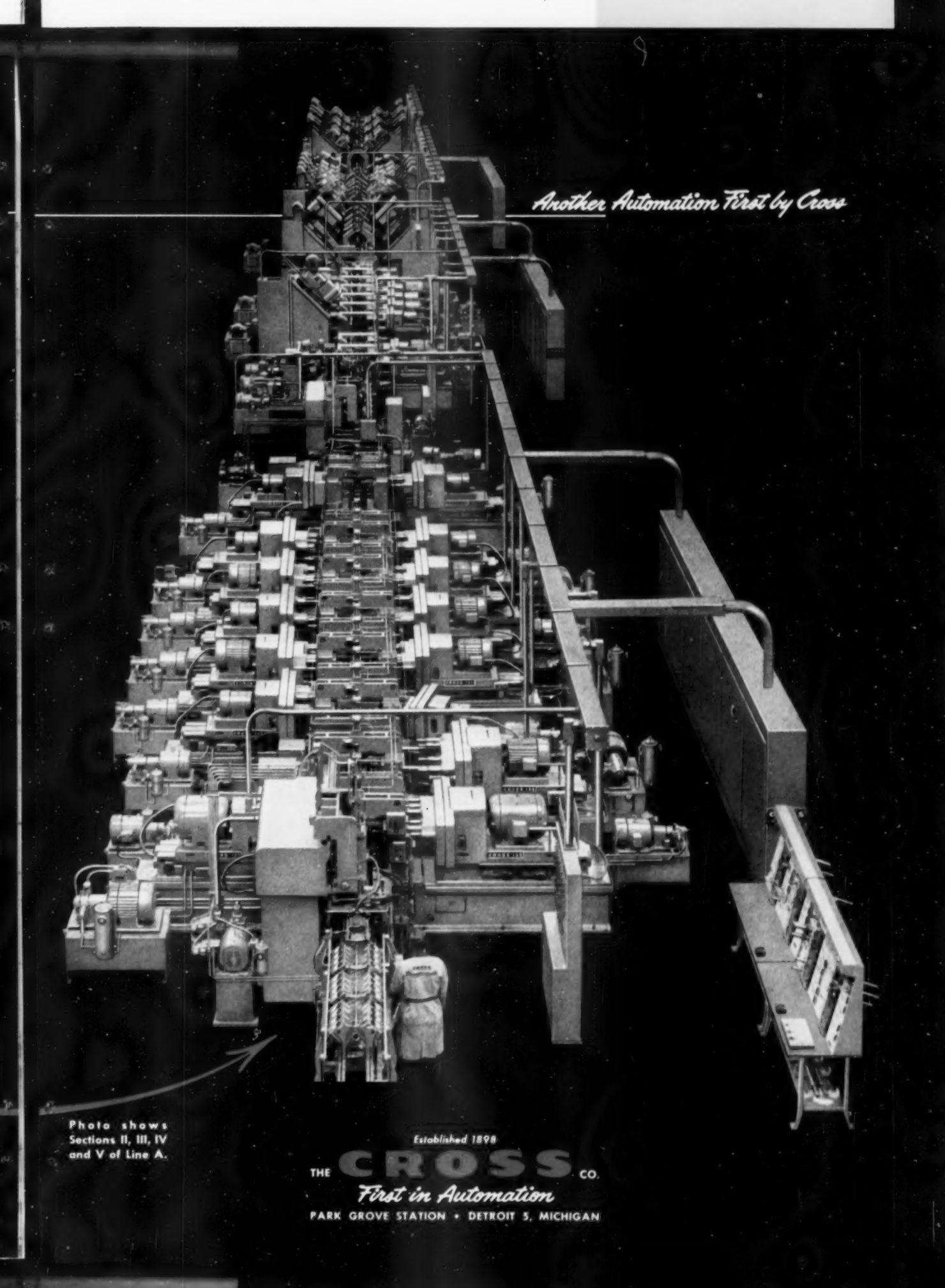


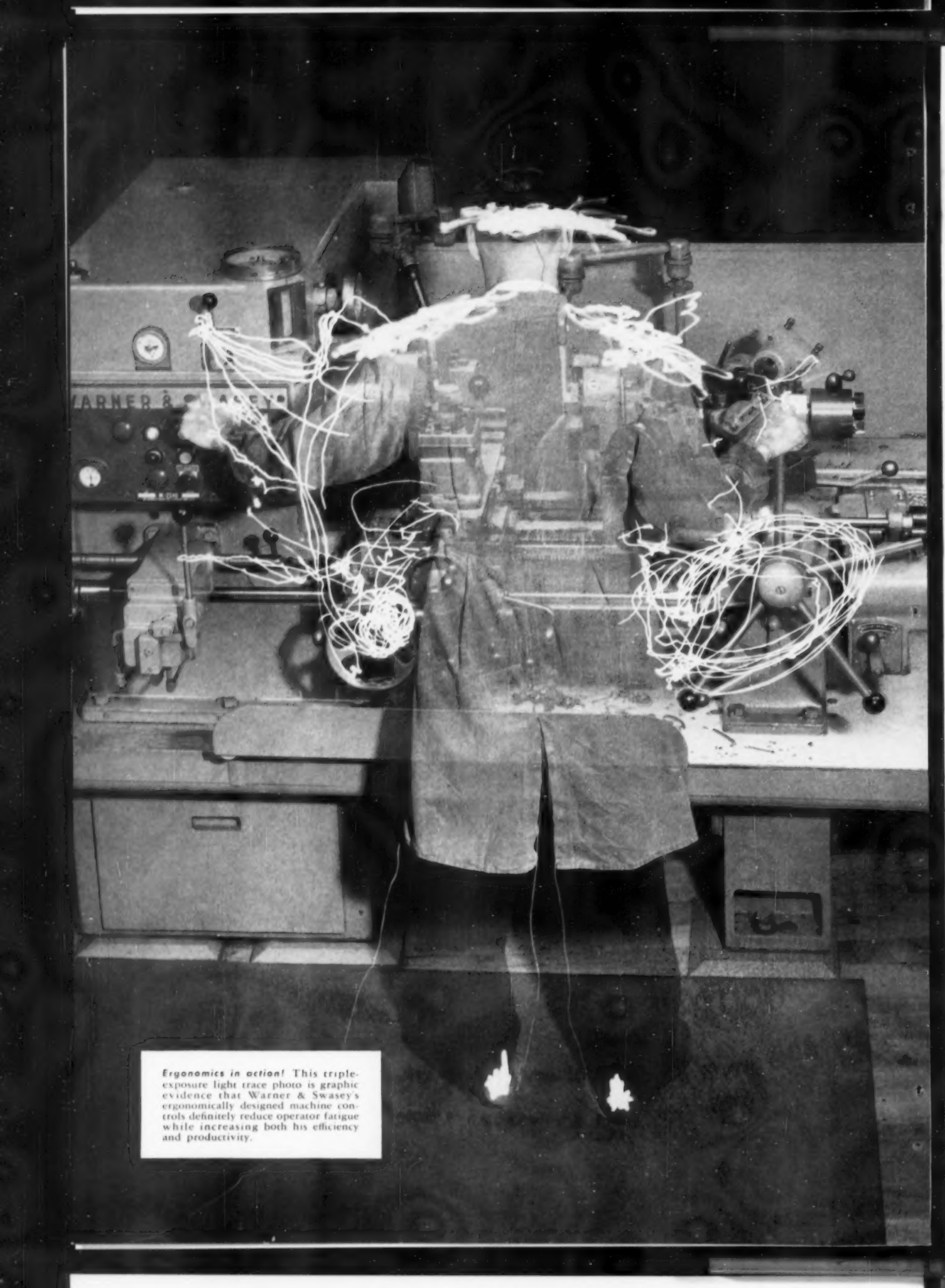

Photo shows Sections II, III, IV and V of Line A.

Established 1898

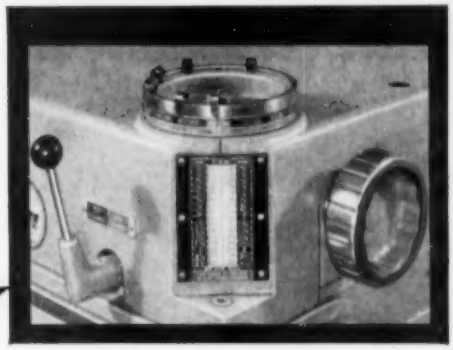
THE CROSS CO.

*First in Automation*

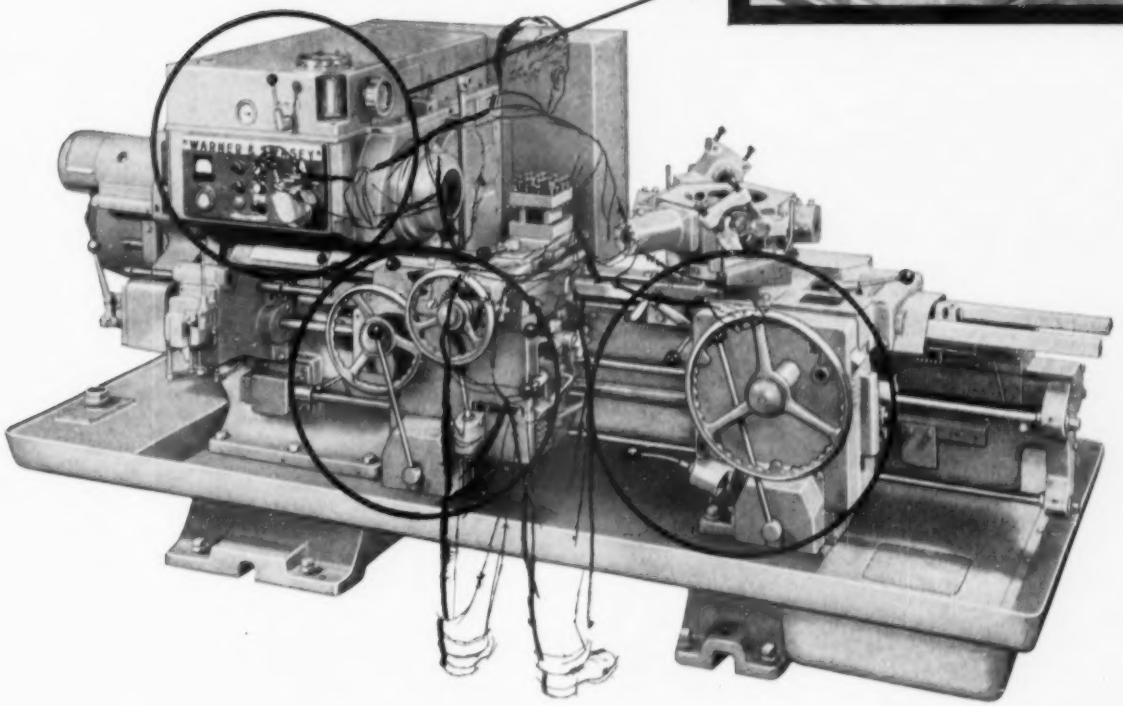
PARK GROVE STATION • DETROIT 5, MICHIGAN



***Ergonomics in action!*** This triple-exposure light trace photo is graphic evidence that Warner & Swasey's ergonomically designed machine controls definitely reduce operator fatigue while increasing both his efficiency and productivity.

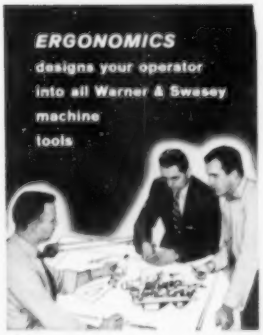


*This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.*



## Warner & Swasey "ZONED CONTROLS"

### *boost production by helping increase operator efficiency*

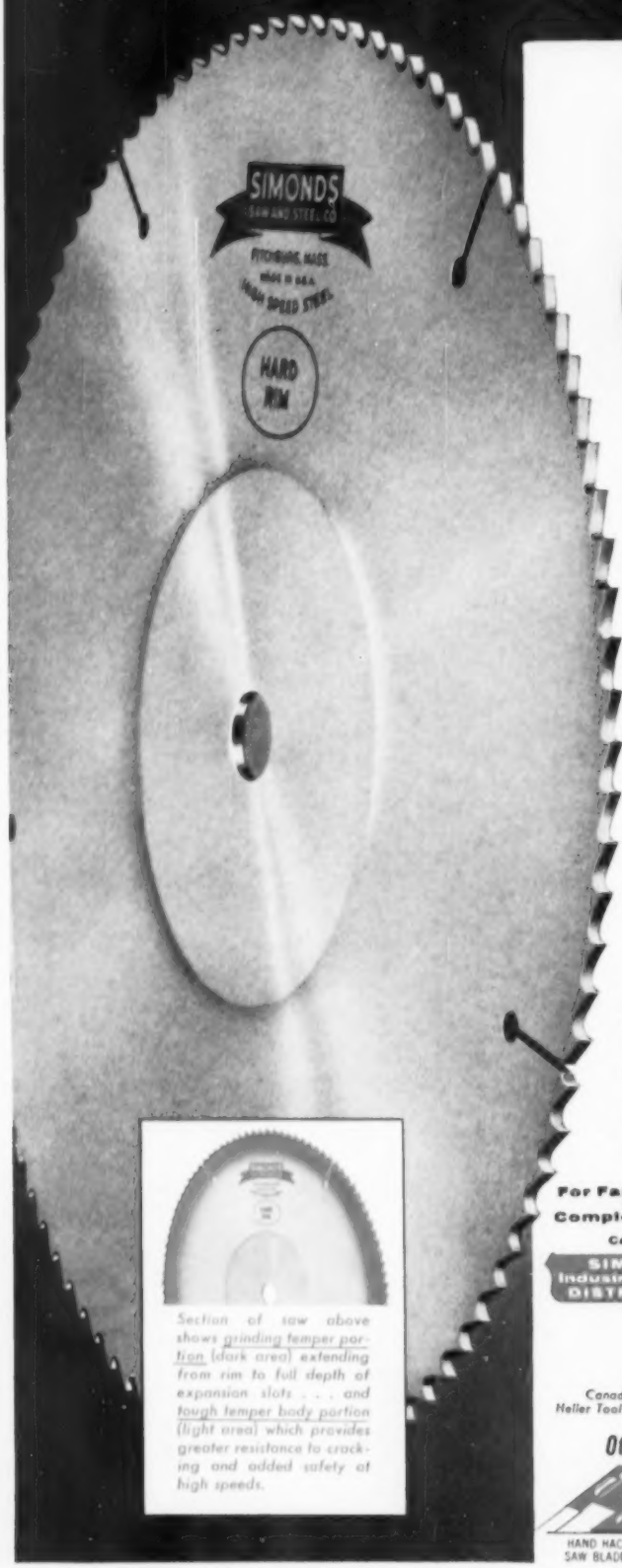



Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching — all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector — calibrated in surface feet and spindle RPM's versus work diameters — that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

WARNER & SWASEY
*Cleveland*
PRECISION MACHINERY SINCE 1880

**YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY**

# NEW!






*Section of saw above shows grinding temper portion (dark area) extending from rim to full depth of expansion slots . . . and tough temper body portion (light area) which provides greater resistance to cracking and added safety at high speeds.*

## SIMONDS HARD RIM SAW

- **Longer Cutting Life**
- **Maximum Safety**
- **Minimum Kerf**

Here's Simonds *newest* — a solid saw that offers longer cutting life and greater safety similar to Simonds Inserted Tooth or Segmental Saws. Specifically, it provides increased cutting life between sharpenings . . . decreased breakage at high speeds . . . and less kerf (as compared to non-solid saws). The saw *rim* is made extremely hard for tremendous resistance to abrasion and wear — the saw *body* is made just hard enough for true cutting of non-ferrous metals and plastics on all types of machines.

Simonds "Hard Rims" will produce a better finish because the solid tooth design cuts truer . . . you can safely run 'em at higher speeds because they will not shatter. And they can repeatedly be resharpened on standard saw grinding equipment. When you get yourself a Simonds "Hard Rim" (8" to 18" dia.), you've got yourself a SAW, brother!

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Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

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# specializing only in drill jig bushings

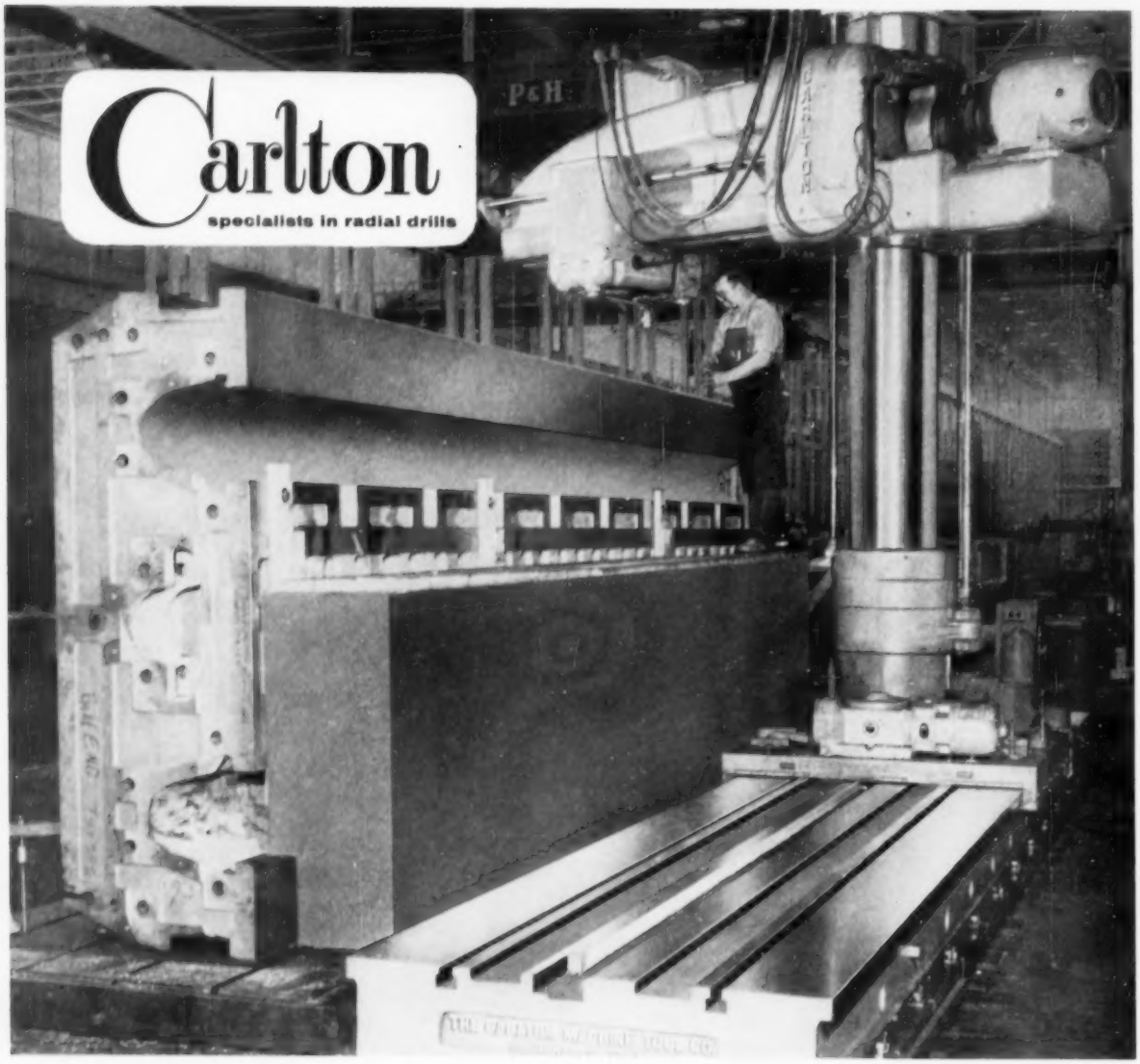


American SPECIALIZES — that's the reason you get BLUE CHIP service when it comes to drill jig bushings. For instance, American's exclusive distributors can immediately fill every A. S. A. requirement —and more than 50 per cent of what are usually considered "specials" right off the shelf. Specializing also means you buy the finest drill jig bushings when you buy AMERICAN!

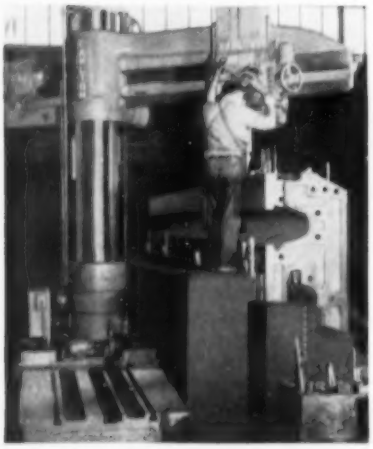
**American DRILL BUSHING CO.**

**5107 Pacific Blvd. • Los Angeles 58, Calif.**

*SEND FOR FREE COPIES OF OUR NEW CATALOGS*




# K&T likes Carlton's hole drilling mobility and accuracy



This Carlton radial drill really "gets around" at Kearney & Trecker Corp., Milwaukee. A special sliding bed plate brings Carlton's hole drilling efficiency to bear over the entire length of this enormous 23-foot long K&T milling machine base. It drills 216 holes at one setting without the necessity of lifting so much as an ounce of its 12 tons. Think what this special Carlton mounting means in time, energy and money saved!

And this ingenious mobility means even more when you add to it the many other advantages of Carlton radial drills: low-hung drive, super-precision column clamp, 3-unit power clamping, positive tooth feed clutch and easy, economical maintenance. Arm lengths from 3 feet to 12 feet, column diameters from 9" to 26". Send today for descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

# 100% BUTTERFIELD



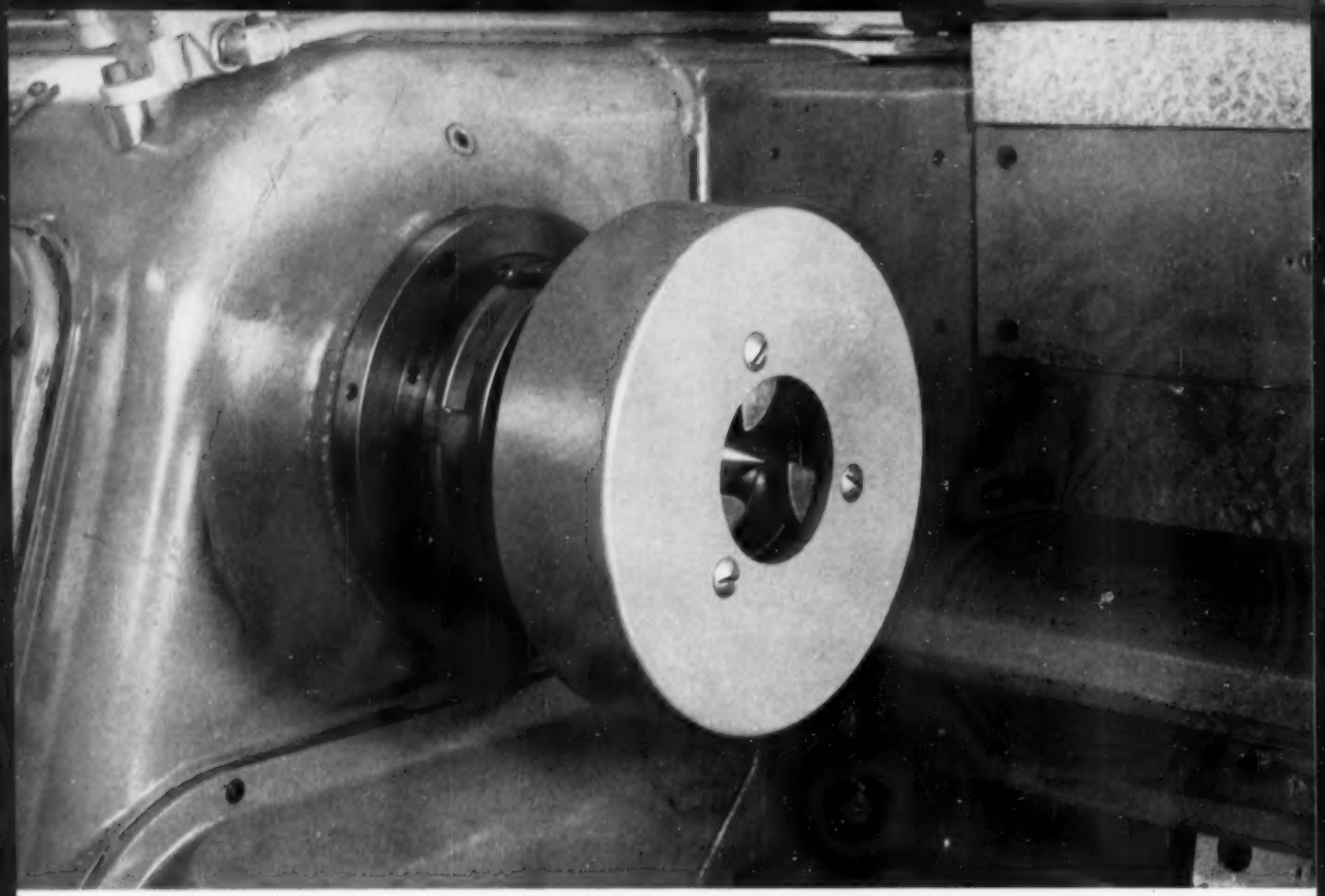

## Special Purpose Taps

Ideal performers in metals like stainless steel, cast iron, brass, aluminum, magnesium . . . with different cutting angles and surface treatments . . . at standard prices from stock.

**100% COMPLETE LINE . . . EVERY TOOL 100% INSPECTED . . . AND YOU GET**

**100% SERVICE FROM YOUR BUTTERFIELD DISTRIBUTOR**

Butterfield also offers a complete line of taps, dies, drills, reamers, cutters, end mills, hobs and carbide cutting tools. There are Butterfield warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York, San Francisco. **BUTTERFIELD DIVISION** • Union Twist Drill Company • **Derby Line, Vermont.**



# This time saver will quickly pay for itself in your plant

For turning between centers, give your present lathes the time-saving advantages of the same +GF+ Work Driver used on the world famous George Fischer Lathes.

It clamps and unclamps with a slight turn of the hood. Clamps rough or smooth blanks and out-of-round forgings evenly. Automatically matches clamping force to cutting pressure. No fussing with driving dogs, no time-wasting hand wrenching.

Five models of the +GF+ Work Driver give you diameter capacities of 1/4" to 8-1/16"— each model drives a wide range of diameters. Write for the +GF+ Work Driver Bulletin, which gives full information, specifications, and applications. Write Dept. 189



Best way of all to drive out-of-round forgings and other work pieces. Jaws are held in a floating ring which fits them to the work piece and drives with evenly distributed force.



A half-turn of the hood engages or releases the jaws — no wrench needed. Jaws can easily be set to drive in either direction. Hood is easily removed for changes to jaws accepting different diameters.

***Skinner Chuck Company is national distributor for the +GF+ Work Driver. Sales are handled through Industrial Distributors, Machinery Dealers, and Machine Tool Builders.***

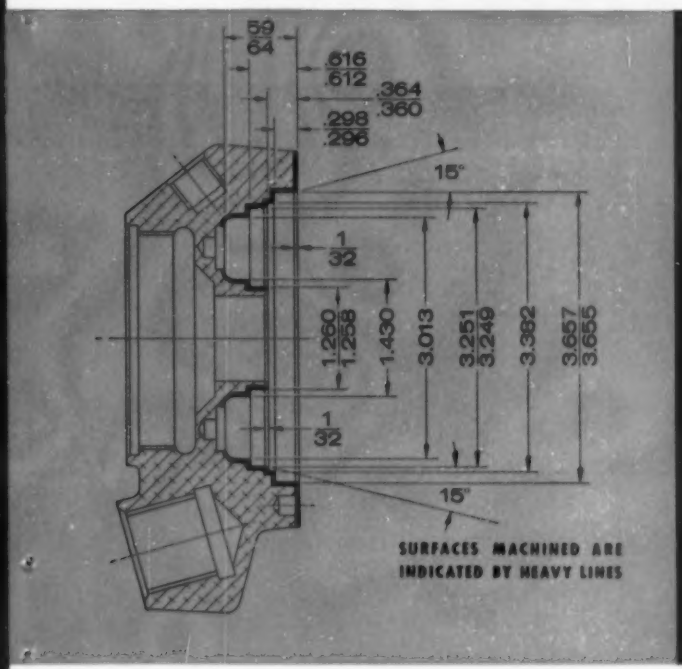
SKINNER CHUCKS

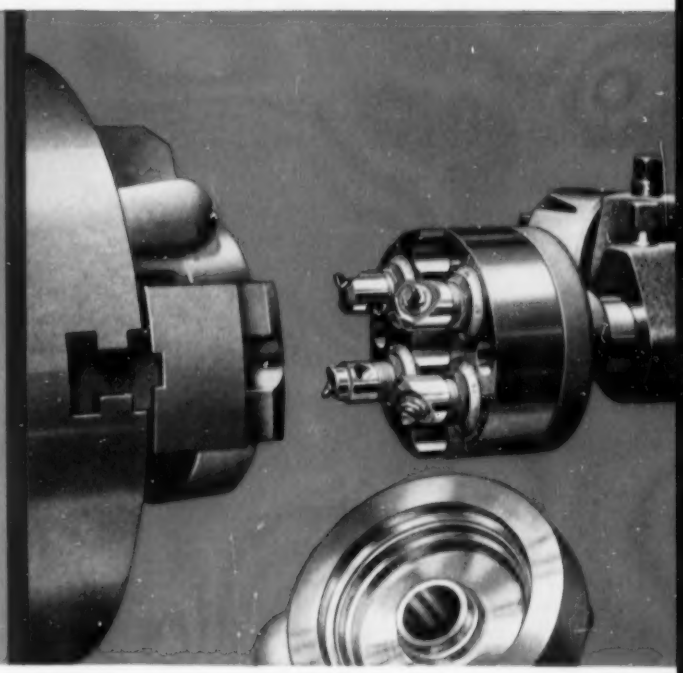
# THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

# 13 surfaces finish machined in 2 passes...



## HERE'S HOW MICROBORE CLUSTER TOOLING DOES IT ON A TURRET LATHE!

This Special Microbore Production Tooling was designed for a well known hydraulic pump manufacturer to machine pump covers on a turret lathe. Operations include precision boring and turning thirteen diameters and faces in only two passes. Think of the costly manhours saved and down time eliminated in comparison with conventional, piecemeal methods of handling this same job.

ACCURACY IS AN ECONOMY—With the Microbore System of cluster tooling, independent precision adjustment of each Microbore tool point permits accurate settings in a matter of seconds. On piece after piece, machined surfaces are held to extremely fine limits.

Microbore is a versatile tool that can be applied singly or in clusters for all types of boring, turning and facing operations. Microbore also manufactures Standard Boring Bars, Boring Bar Sets and Microbore Flash-Change Tooling—the ultimate for quick change tooling.



**•Join the leaders who are already multiplying their profits with modern Microbore tooling and methods. Write for Catalog No. 56.**

# DeVlieg Microbore System

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

*2720 West Fourteen Mile Rd., Royal Oak, Michigan*

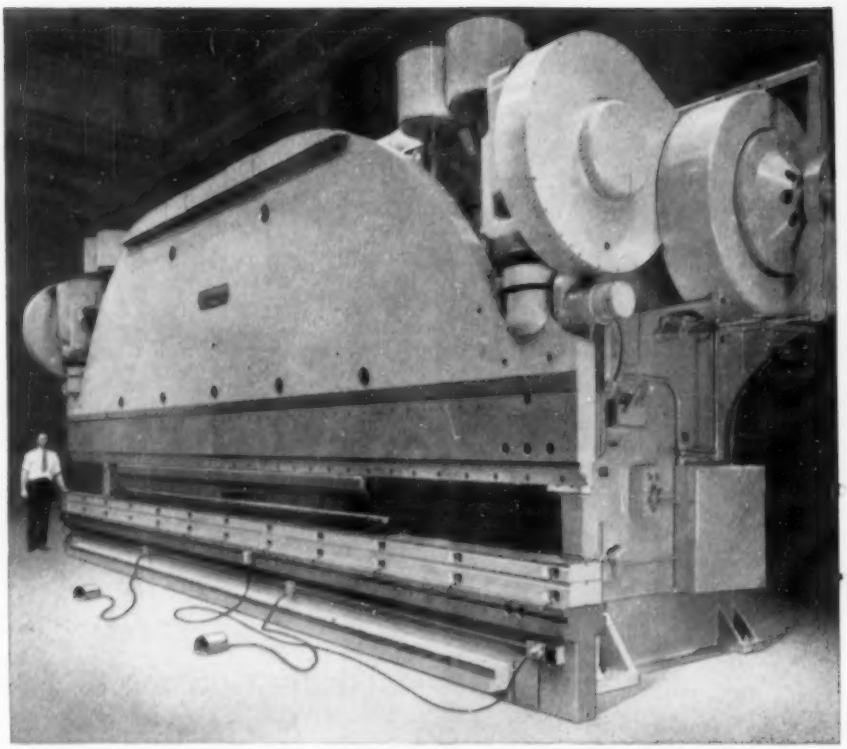
# CINCINNATI
# PRESS BRAKES

There are over 80 standard machines in the Cincinnati Press Brake line, ranging in length from 4′ to 20′ between the housings. 15 different tonnage capacities are available. Although they differ widely in size and capacity, they all have one feature in common . . . ***accuracy.***

This isn't an unsupported claim. The accuracy of the thousands of Cincinnati Press Brakes in operation has been time-proven . . . just check the production record of any one of them. A few of the features which contribute to this accuracy are:

- All-Steel, interlocked construction—no welds used as load supports, yet the bed is directly supported by the housings.
- Centerline loading—no weaving of the frame, since forces are contained within the housings.
- Deep beds and rams—depth in these members means rigidity, and rigidity means accuracy.

Write Dep't. E for Catalog B-5.



## AND . . . . PRESS BRAKE DIES



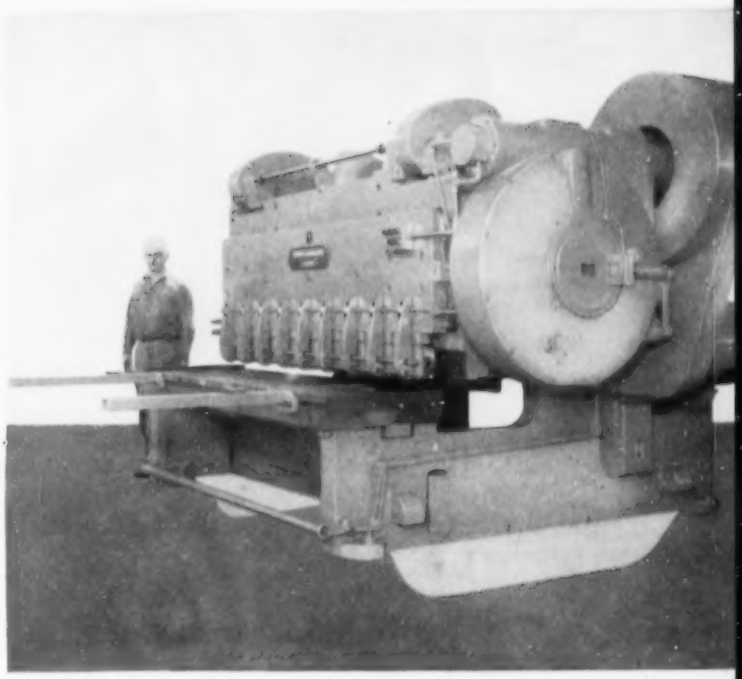
A 4-way die, equal to 4 V-dies, is shown in No. 1. No. 2 shows culvert sections being formed in repeat hits. Roof decking is made with the dies shown in No. 3.



No. 4 shows a punching setup with gags. The progressive setup in No. 5 does punching and drawing. The progressive setup in No. 6 makes refrigerator top parts.

We are prepared to design and furnish the tooling needed to convert your ideas into finished products. A background of 30 years of experience is represented in our Application Engineering Department, in literally every field associated with our machines. The photos at the left show just a few examples. For complete information, write Dep't. E for Catalog D-2.

# CINCINNATI SHEARS

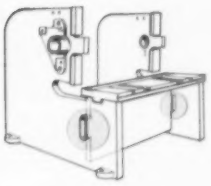


Cincinnati All-Steel Shears combine micrometer accuracy with high speed operation. Straight and parallel cuts are consistently produced, so accurately that only a micrometer can detect any variation in width of the sheared piece.

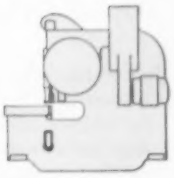
This accuracy doesn't call for special skill or manipulation on the part of the operator. As a matter of fact, Cincinnati Shears are built to cut all thicknesses, from thin material up to capacity, ***without changing knife clearance.*** This prevents accidental damage and eliminates interruptions in production.

Dependability, equally important, is insured by Cincinnati interlocked construction. No welds are used as load supports, yet the bed is directly supported by the housings. All-steel frame members minimize deflection.

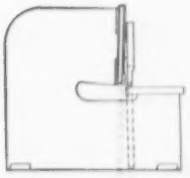
The sketches below show a few important features. For full information, write Dep't. E for Catalog S-7R.



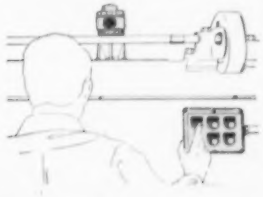
Interlocked construction means no welds used as load supports



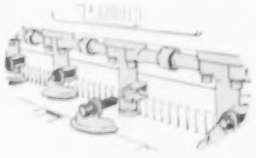
Gap frames allow shearing pieces longer than the machine



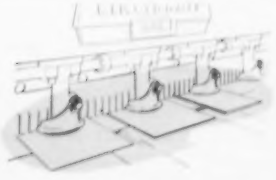
Inclined ram offsets the thrust caused by shearing action.



Front-controlled power back gauge is accurate, fast, convenient.



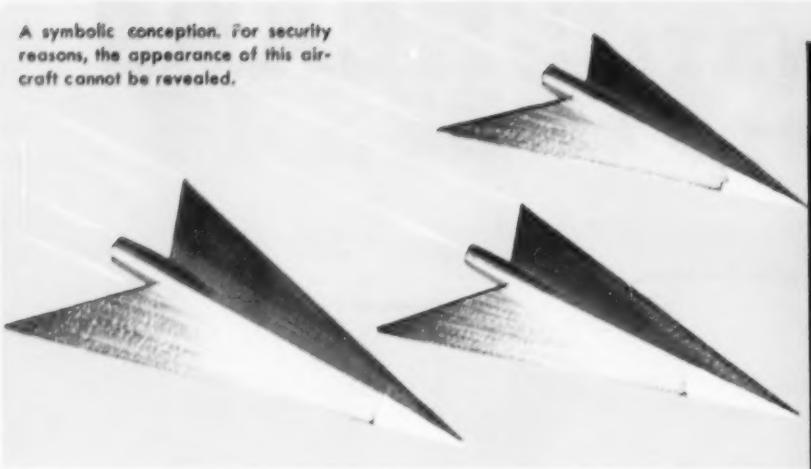
Hydraulic holdowns exert tons of pressure, insure accuracy.



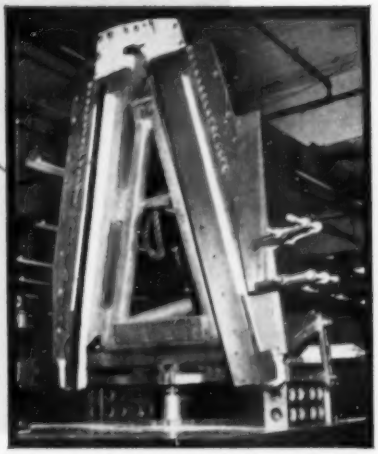
Different gauges, held with same tonnage, can be cut together.

**THE CINCINNATI SHAPER CO.**

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES



A symbolic conception. For security reasons, the appearance of this aircraft cannot be revealed.



A master drill and setting gauge, showing use of Epon resins to duplicate compound curves and contours.

## In building the supersonic Arrow . . .

# Avro Aircraft, Limited saves time and money with

# EPON® RESIN

## dies, tools, jigs, molds and fixtures

Avro Aircraft, Limited—developing Canada's supersonic Arrow—is achieving major savings with Epon resin tooling.

Epon resins provide faster, lower cost preparation of stretch dies, forming tools, drop hammer dies, jigs, duplicate master die molds, checking and assembly fixtures. Avro reports that in making dies of Epon rather than metal, manpower requirements are two-thirds less, which is reflected in correspondingly great savings in the unit cost of tooling.

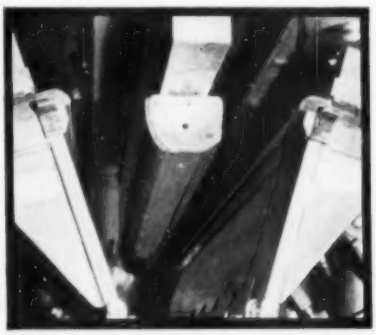
The Epon resins have an ideal combination of properties for tooling applications. To list just a few:

- Exceptional dimensional stability, high impact strength, excellent resistance to abrasion, minimum residual stress in cured parts.
- Ease and speed of preparation.
- Low shrinkage in filled formulations, assuring perfect master reproduction; minimum warping and stresses.
- Adaptability to repairs and design changes.
- Minimum finishing requirements for smooth surfaces.

Like Avro, other leading manufacturers report savings as high as 80% with Epon resin tools and dies—for *production* as well as experimental and short-run work. Can you make comparable savings in your own operations? Find out by writing for technical literature on Epon resins for tool and die applications.



Epon-faced die requires only hand rubbing to achieve smooth finish. Radii are being touched up with sander.



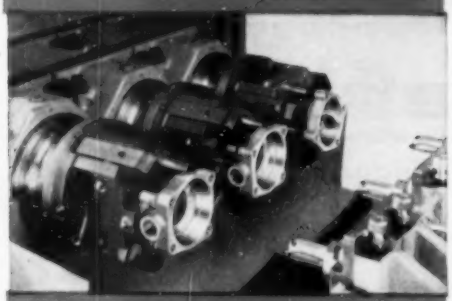
Stretch die, with Epon resin facing of involved contours, ready for run on 800-ton press.

**SHELL CHEMICAL CORPORATION**

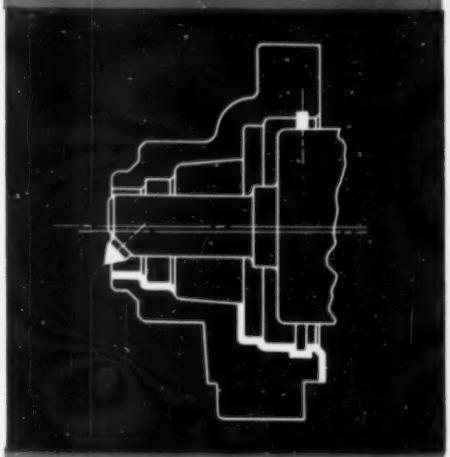
**CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York**

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco • St. Louis
IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited • Montreal • Toronto • Vancouver

SHELL



Showing parts mounted in the chuck. Without chuck changes, any of three parts having different exterior forms but identical interior contours can be accommodated.



12 operations are performed in one machine cycle. Heavy lines denote surfaces machined.

# Intricate contouring is fast, accurate—

## 12 operations in one cycle!

Direct cam action—no levers—provides Ex-Cell-O Precision Boring Machines with accuracy, versatility and speed in difficult contouring operations.

In the application shown here—contouring an internal form in die-cast aluminum end covers—limits on diameters are held as close as plus or minus .0005 inch, and three work pieces are completed at a time. 12 separate operations are performed in one machine cycle, including precision boring, facing, chamfering and grooving.

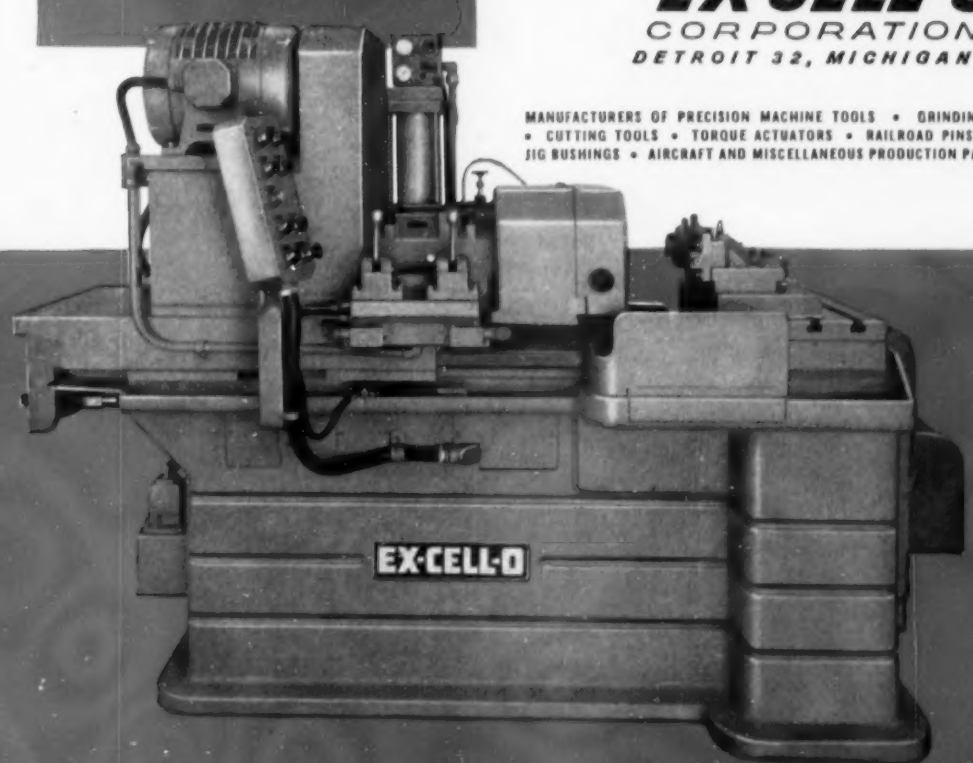
Cams can be changed in minutes. Cam assembly swings out for quick, easy change. All motors are outside the base.

Another Ex-Cell-O feature is the large chip chute, cast as an integral part of the base. There are no openings where chips or coolant can enter the base. Contact your Ex-Cell-O representative or write direct for complete information.

**EX-CELL-O**
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-62




XLO

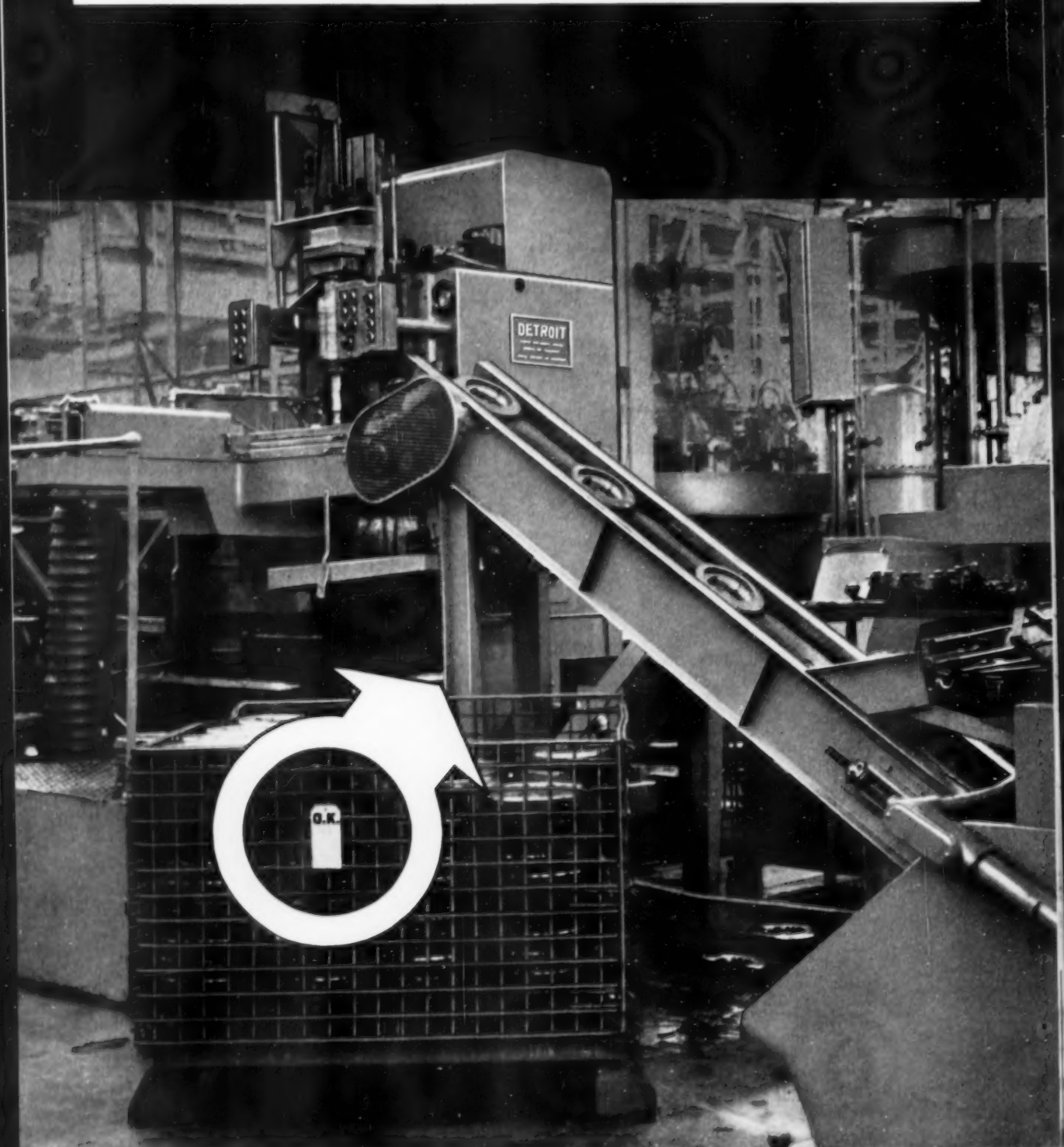
EX-CELL-O FOR PRECISION

At left: The Ex-Cell-O Styled 312 Cam Operated Precision Boring Machine. A smaller model, the Ex-Cell-O Style 308, is also available because of the demand for this type of machine.

# DETROIT BROACH

*In the Production Picture with Industry's Leaders*

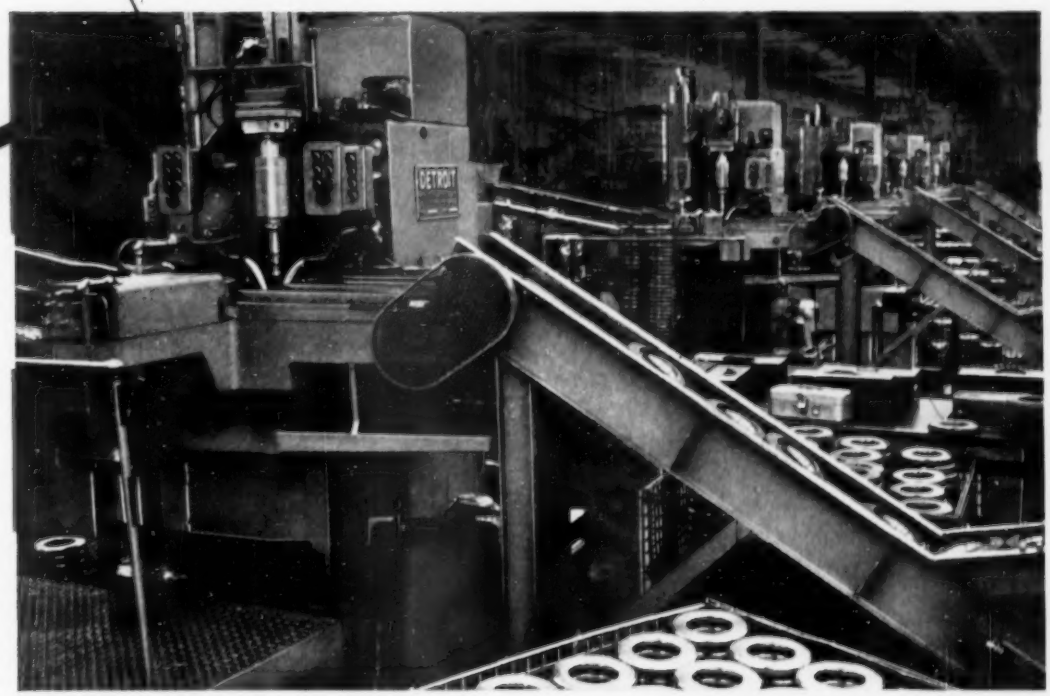
**LOCATION: Ford Chassis Parts Division**
**Sterling Township, Michigan**



# O.K. 1440 GEARS PER HOUR

## FROM THIS LINE OF

## DETROIT BROACHING MACHINES



The recently opened Ford manufacturing plant in Sterling Township, Michigan, is a 1,800,000 square foot model of production efficiency. Prominent in this production picture is a line of six Detroit Vertical Pull Down Broaching Machines, each machining tough ring gear forgings in completely automatic production cycles. Here are the job facts:

**PART:** Forged rear axle driven gear, SAE 8620.

**MACHINE:** Detroit Vertical Pull Down, 5-ton broaching capacity, 30" stroke.

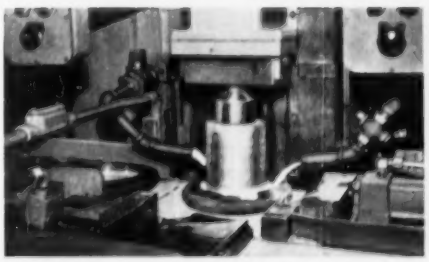
**OPERATION:** Broach 4.987-4.988 I.D., starting in a 4.972-4.978 diameter hole following automatic chucking operation.

**MACHINE CYCLE:** (1) Part conveyed to load position, (2) Part hydraulically advanced to broaching position, (3) Pusher returns, signalling retriever down, (4) Broach picked up by puller and pulled down through part, (5) Part automatically ejected, (6) Ejector signals broach return to retriever, slide goes up, (7) Next part advanced to broaching position.

**STOCK REMOVED:** .0075" per side.

**HOURLY PRODUCTION:** 240 parts per machine at 100% efficiency.

This combination of *standard* Detroit broaching machines with relatively simple work handling devices results in a highly productive, fully automatic operation . . . plus the economy of standard production equipment, readily adaptable to future changes. Let Detroit Broach engineers suggest the right machine, the most efficient tooling and the correct degree of automation to solve *your* production machining problem. Send parts, prints or details for prompt recommendations.



This tool will broach 33,600 tough forgings before regrinding is necessary, according to tool life records carefully kept by Ford Motor Company.



Same plant, different department. One of two Detroit 15-ton, 66-inch stroke Vertical Twin Ram machines on bearing cap forgings.

**DETROIT BROACH** & MACHINE COMPANY

DEPARTMENT D-9 • ROCHESTER, MICHIGAN

# Up to 40% higher tightening torques keep a

## —and only the combination of an UNBRAKO screw

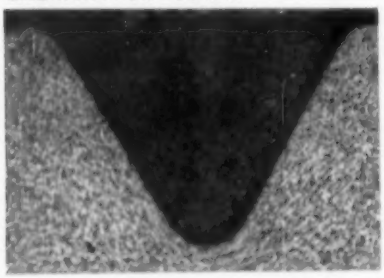
**RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES**
**(Inch-Pounds)**

| SCREW SIZE | UNBRAKO | SET SCREW B | SET SCREW C | MINIMUM DIFFERENTIAL % |
|---|---|---|---|---|
| #4 | 5 | 3.9 | 3.5 | 28 |
| #5 | 9 | 7.8 | 7.4 | 15 |
| #6 | 9 | 7.8 | 7.4 | 15 |
| #8 | 20 | 14.7 | 14.5 | 36 |
| #10 | 33 | 26.5 | 25 | 25 |
| 1/4 | 87 | 62 | 60 | 40 |
| 5/16 | 165 | 122 | 125 | 32 |
| 3/8 | 290 | 198 | 225 | 29 |
| 7/16 | 430 | 309 | 350 | 23 |
| 1/2 | 620 | 460 | 500 | 24 |
| 5/8 | 1225 | 1106 | 1060 | 11 |
| 3/4 | 2125 | 1540 | 1800 | 18 |
| 7/8 | 5000 | 3660 | 4600 | 9 |
| 1 | 7000 | 5025 | 6500 | 8 |

The High-Torque UNBRAKO socket set screw is made to withstand the highest tightening torques ever used to seat a set screw—up to 40% higher than an ordinary set screw. But to take full advantage of this UNBRAKO feature you must have a key that can apply the force required to seat it without damaging the screw or snapping the key. The High-Titan UNBRAKO hex key is designed specifically to set a High-Torque UNBRAKO so that you can be assured of full *high-torque* performance every time.

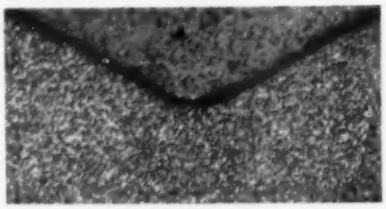
### Here's why a High-Torque UNBRAKO can be seated tighter—and stay put

**UNBRAKO SET SCREW**



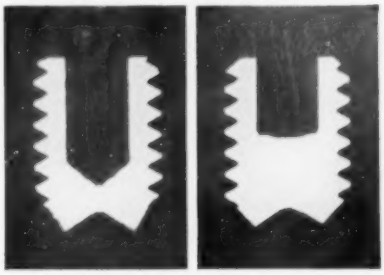
It has fully formed threads that make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see in this illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010 in. below root diameter. Screws with cut or ground threads lose thread form at root diameter.

**UNBRAKO SET SCREW**



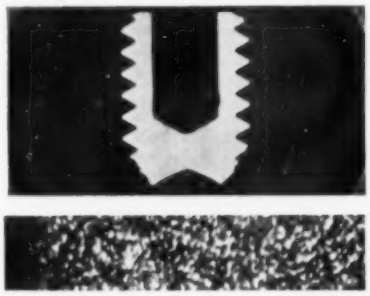
The High-Torque UNBRAKO has a radius in the socket corners. This eliminates the sharp corners where cracks start. It also distributes the stresses developed when tightening torques are applied. Ordinary socket screws have sharp corners which often crack when tightened even at lower torques than those recommended for UNBRAKO.

**UNBRAKO SET SCREW** **ORDINARY SET SCREW**



The High-Torque UNBRAKO has a deeper socket, which gives you more purchase with the wrench. Since more wrench can be put into the UNBRAKO socket, you can set the screw much tighter. And you won't ream the socket or round the corners of the wrench.

**UNBRAKO SET SCREW**

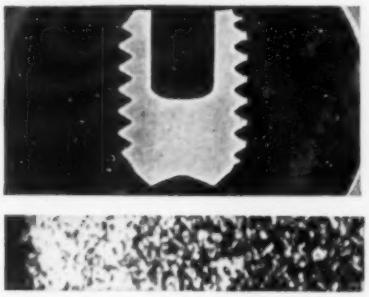


The High-Torque UNBRAKO is properly heat treated, kept clean. Its grain structure is uniform. It is free of decarburization. There's no danger of stripping the threads or shearing the point when tightening

# High-Torque UNBRAKO socket set screw tight

## and key assures full *high-torque* performance

**ORDINARY SET SCREW**



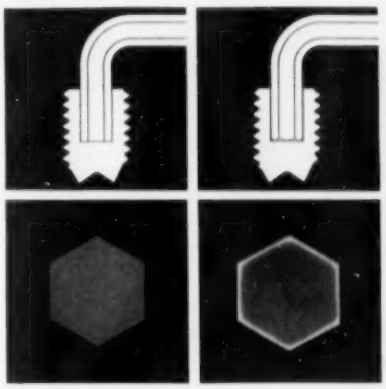
torques are applied. The ordinary screw is suffering from an overdose of decarburization; socket walls, threads and point are full of the telltale white spots that identify it.

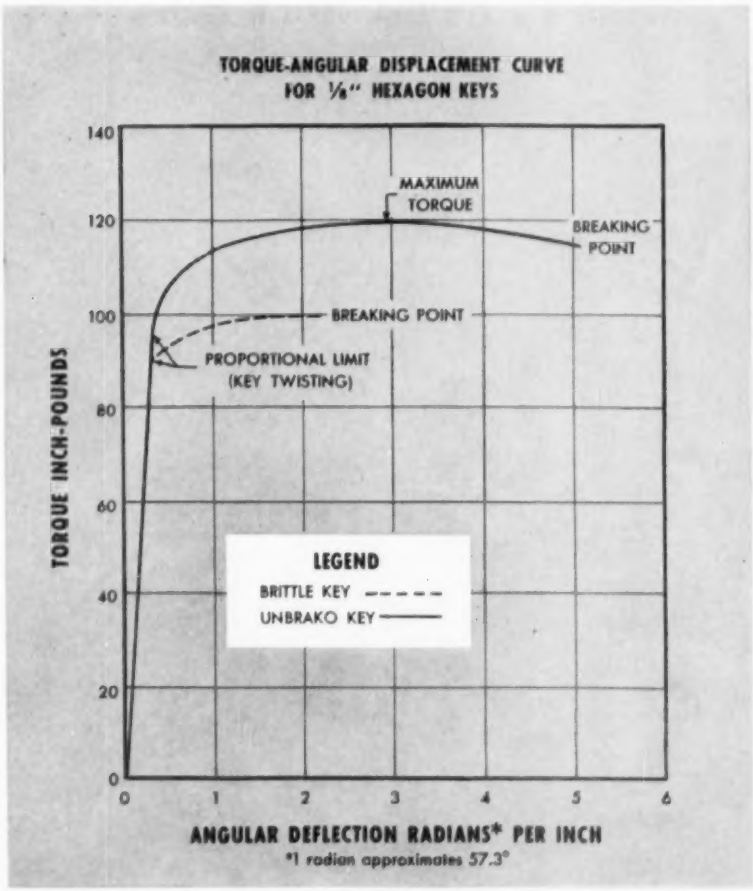
And here's why an UNBRAKO High-Titan hex key can be used to apply far more tightening torque to a High-Torque UNBRAKO socket set screw than is needed without damaging either the screw or the key.

The High-Titan UNBRAKO is not an ordinary hex key. It is a precision internal wrenching tool with high ductility, specially designed to assure full high-torque performance. It is made of special alloy steel bar stock, inspected magnetically and chemically to make sure that the material is flawless and of the specified properties. Its sides are flat and parallel. The corners, which exert torque on the inner walls of the socket, are sharp and tough. The bend is strong.

The High-Titan UNBRAKO is accurately sized across the flats and across the corners to insure snug fit and full wall contact. It won't ream or wear an UNBRAKO socket. The square cut end engages the full depth of the socket for greater tightening power. It gives you up to 25% more wrench engagement than a key with a chamfered end.

**UNBRAKO KEY** **CHAMFERED END KEY**





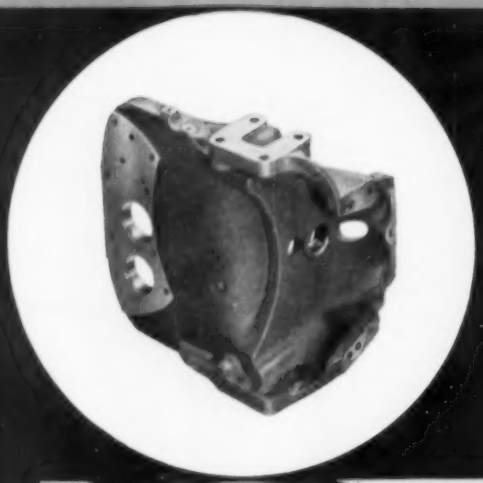

The High-Titan UNBRAKO hex key is heat treated in modern atmosphere-controlled furnaces. The surface is casehardened without decarburization. The extra hard surface gives the key longer life. And it retains its dimensional accuracy, is tougher and more ductile than ordinary keys. This torque-angular displacement curve for ⅛ in. hexagon keys distinguishes a High-Titan UNBRAKO from an ordinary key. The High-Titan UNBRAKO has a higher yield point and a higher breaking point—you can exert a much higher torque with it without snapping the key.

Be sure you get the full high-torque performance offered only by the combination of a High-Torque UNBRAKO socket set screw and a High-Titan UNBRAKO hex key. Both products are stocked by authorized industrial distributors. Ask the one nearest you for complete information. Or write STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

**Unbrako Socket Screw Division** **sps** **Jenkintown, Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Cooper Precision Products • Standco Canada, Ltd. • Unbrako Socket Screw Co., Ltd.



*At Massey-Harris-Ferguson*

# Natcos Save 100 Parts...

*Three multiple-spindle Natcos bore, drill, spotface and tap the front end support for a Massey-Harris-Ferguson tractor*

NATCO

# 60 Man Hours Every

## *on Rugged Axle Support Castings*

Massey-Harris-Ferguson checked it two ways. Nine general-purpose machines would do the job—or 3 Natcos. They chose the Natcos for these reasons:

- *Saving of $30,000 in machine cost*
- *Saving of 60 man hours every 100 parts*
- *Saving of 65% in floor space*

The Natcos handle all drilling, boring, spotfacing and tapping—a total of 67 operations on the 182-pound front axle casting. The casting is heavy, irregular—tough to fixture and clamp. The Natcos meet production requirement of 11 parts per hour.

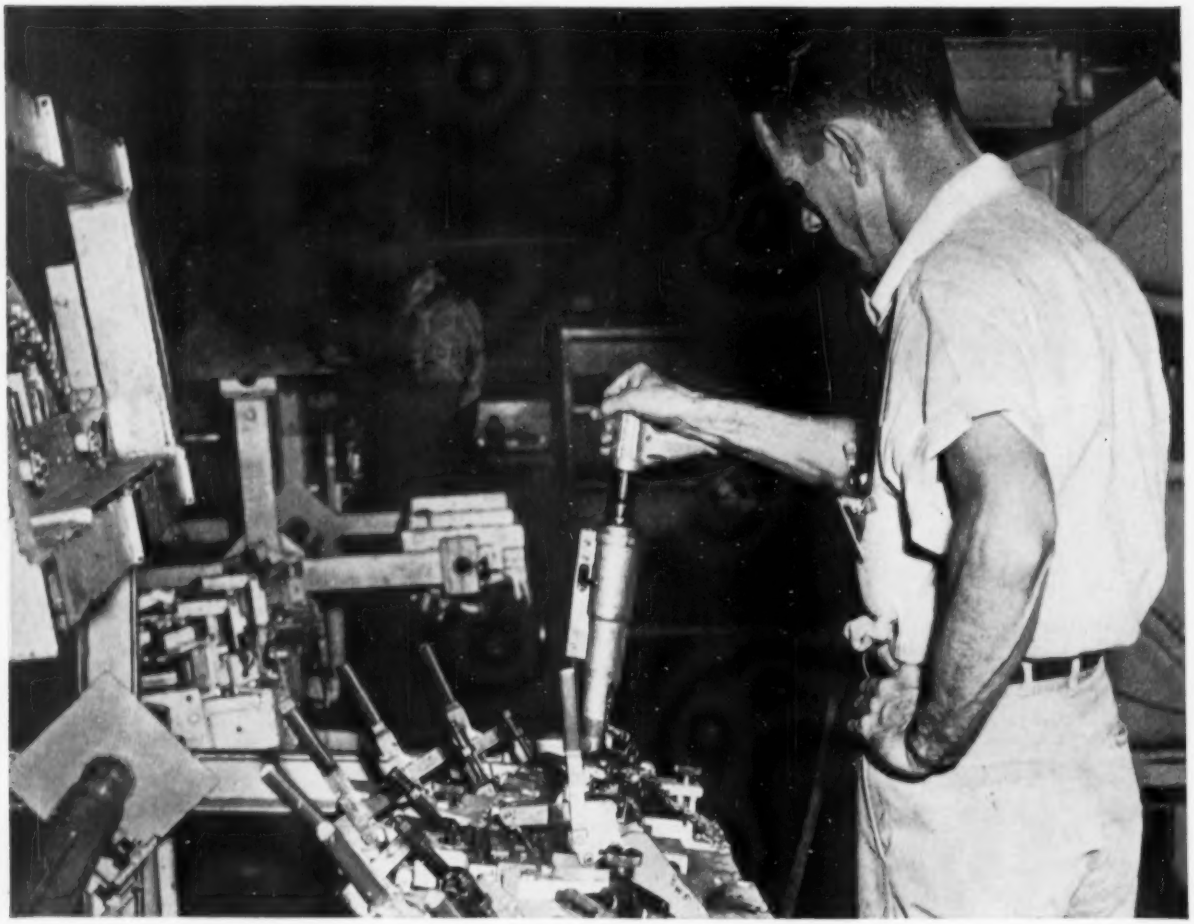
Natco provided complete tooling which features automatic clamping, cycling and chip blow-out. All three machines are of unitized construction, giving Massey-Harris-Ferguson the flexibility to run different parts of redesigns of the same part.

Let Natco Field Engineers point out cost-saving and time-saving methods on your next drilling, boring, facing or tapping job. Natco offices are located in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

## National Automatic Tool Company, Inc.

*Richmond, Indiana*

*Multiple-spindle drilling, boring, facing and tapping machines. Special way-type, index and transfer machines.*



# Now drill accurate holes in hard metals easily . . . with the new portable "K-MATIC"*

**"K-MATIC" FEATURES**

- Develops up to 1000-lb. thrust
- Positive power feed .002" or .003" per revolution
- Simple single-lever operation
- 1¼" stroke length
- Instant automatic bit return
- Adjustable depth stop

This man is standing by while a Keller Tool "K-Matic" portable drilling unit does its work. This new production line drilling unit is only 12" long, weighs less than five pounds; yet it develops up to 1000-lb. thrust, has positive power feed and handles drills up to ⅜".

Thrust is developed against a patented Keller Tool drill bushing tip that is easily locked to a jig by any of several simple methods. Hard metals, soft metals and sandwich construction are drilled so cleanly that reaming is often unnecessary.

Send now for complete information and specifications.

* Trade-Mark

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

**GARDNER - DENVER**

Gardner-Denver Company, Quincy, Illinois



# For better service to you Jessop acquires Green River Steel Corporation

Green River Steel Corporation of Owensboro, Kentucky, one of the newest alloy steel plants in the country, now is a wholly-owned subsidiary of Jessop Steel Company. This fact will result in benefits to the customers of both companies. If you buy steel from Jessop, you have been buying the broadest variety of top quality alloy, high-speed and stainless steels obtainable anywhere. Now with the splendid new and modern melting facilities of Green River in the picture, service from Jessop will be broader and quicker. If you are a Green River customer, you'll enjoy higher quality and more products and the benefits of the exclusive Dornin Process used by Green River which provides steel of unmatched forging qualities and grain structure. If you haven't been buying from either company, this is a good time to start. Write to Jessop.

These Jessop district offices and representatives can now service you with Green River Products

District Offices
Birmingham, Ala.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.
Hartford, Conn.
Indianapolis, Ind.
Los Angeles, Cal.
New York, N.Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Toronto, Canada
Wallaceburg, Canada
Washington, D.C.

Representatives
Charlotte, N.C.
Kansas City, Mo.
Milwaukee, Wis.
St. Louis, Mo.
Utica, N.Y.

# JESSOP

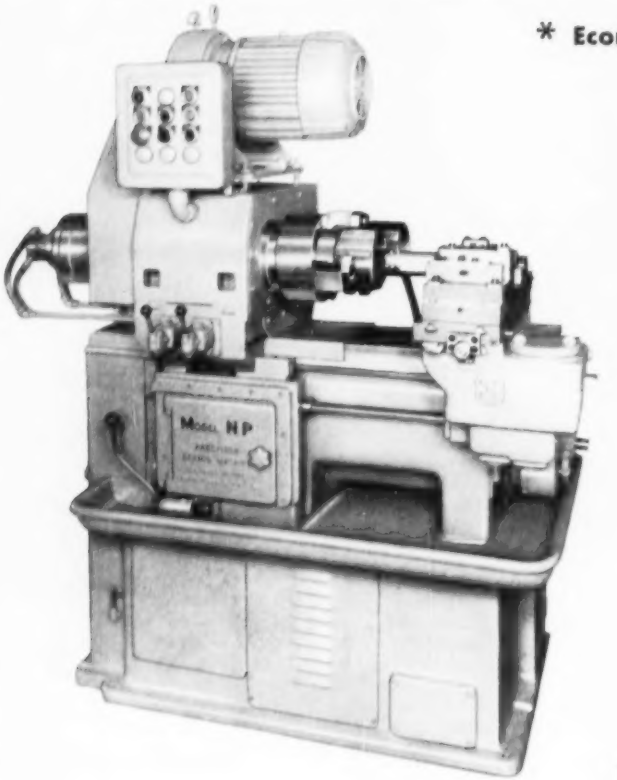
STEEL COMPANY • WASHINGTON, PA.

OFFICES IN PRINCIPAL CITIES

Jessop Steel of Canada Limited, Wallaceburg, Toronto

Jessop Steel International Corp., Chrysler Building, New York, New York

# NEW MACHINE OF THE MONTH
# NEW ECONOMY* IN PRECISION BORING

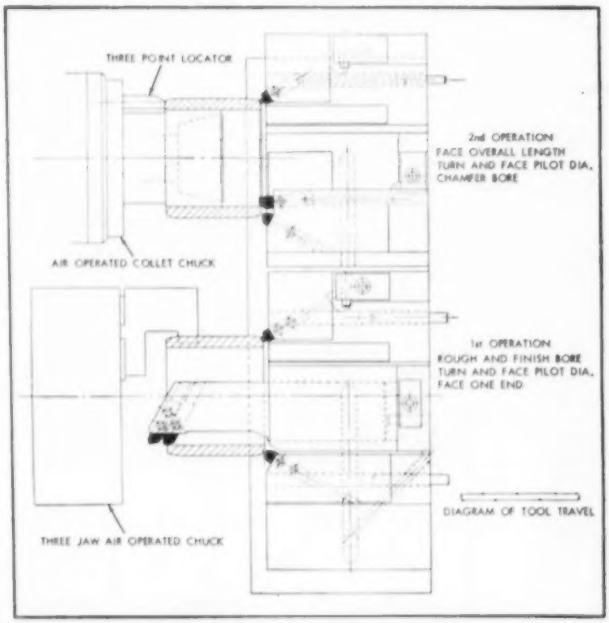



*** Economy in initial investment**
**Economy in machining costs**
**Economy in maintenance costs**
**Economy in change-over time**

The new Seneca Falls Model "NP" Precision Boring Machine is a top quality, reasonably priced, mechanically operated machine available with either one or two precision spindles mounted independently on a fixed bridge. Either the work or the tools can be rotated on the spindles. The patented "Quick Change-over Mechanism" permits variations in carriage stroke, rapid traverse and feed cycle without changing or purchasing additional cams and reduces average changeover time to less than thirty minutes. The design of the headstock bridge permits the installation of other makes of standardized boring heads.

Let our engineering staff help solve your precision machining problems.

The two-spindle machine illustrated above is equipped for boring, facing and rabbeting both ends of field rings in a single machine cycle. When the operator removes a finished piece from the rear chuck, he transfers a semi-finished piece from the front chuck and replaces it with a rough piece. When the starting button is pressed, the tools move forward in rapid traverse to cutting position, automatically shift to cutting feed, and finally return to starting position in rapid traverse. The entire operation is automatic. The field rings are 4-½" in diameter and a production of 60 pieces per hour at 100% efficiency is easily maintained. Tooling arrangement is illustrated opposite.



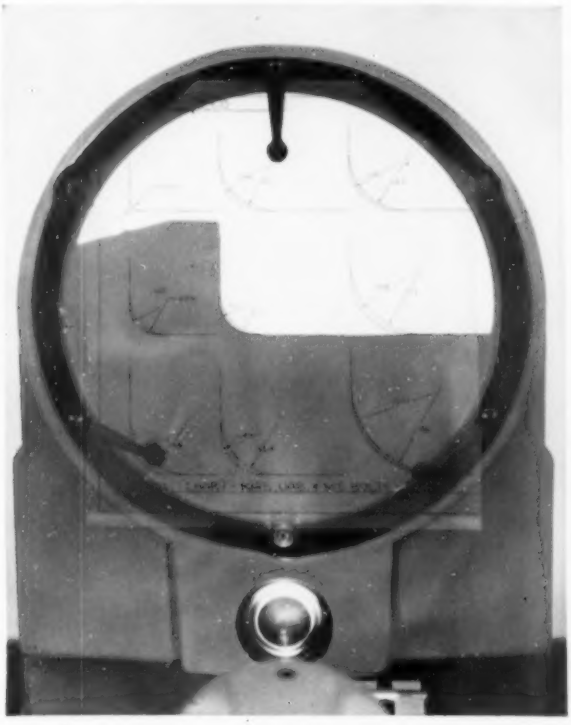

SENECA FALLS MACHINE

ENGINEERED FOR PROFIT

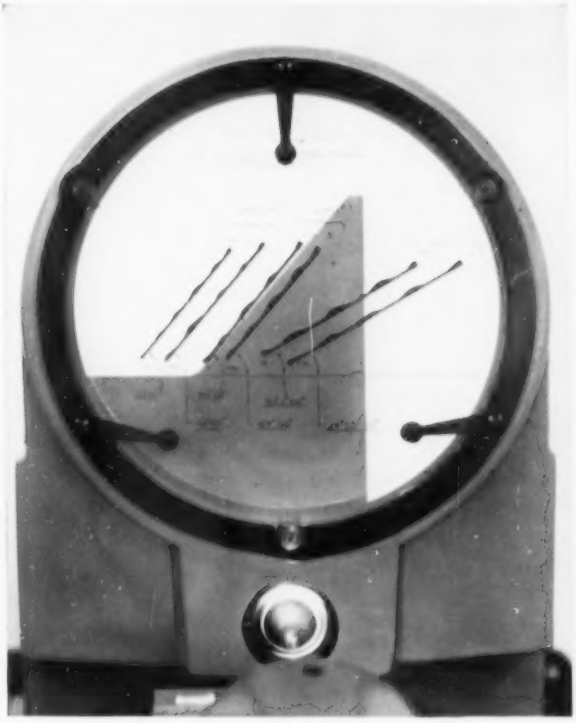
**SENECA FALLS MACHINE CO.**

SENECA FALLS, NEW YORK

Lo-swing Lathes and Seneca Falls Machine Tools, Automation and Electronics



1–A typical MS aircraft bolt has a radius tolerance of .031-.041 on the fillet where the head joins the shank. By placing up to 9 radius drawings on a single overlay chart, a number of machine operators can check fillets during production.



2–Another typical job at Standard Pressed Steel Company involves checking the angularity of a 100° flush head bolt to ½°. Angularity is checked at the same time that the radius is measured to .0015" (limits are .016-.019).

# How Kodak Contour Projectors help keep gage inventories low in production checking

Standard Pressed Steel Company—manufacturer of aircraft bolts, socket screws, and other close-tolerance fasteners—once needed as many as 26 radius gages to check the fillets of *each type of bolt* it made while the bolts were in production.

Multiply this figure by the number of types of fasteners . . . add the gages required for checking other dimensions such as root radii—and you get an idea of the vast inventories involved in conventional inspection methods.

Now SPS does much of its production inspection by optical means with Model 8 Kodak Contour Projectors—and gage inventories have been slashed for these 4 important reasons:

- Light in weight, the Model 8's can be readily moved, used where needed on the production line.
- A single Contour Projector can serve several machine operators, since one screen chart can show tolerance limits for as many as nine different radii. (Fig. 1)
- A single chart can check several dimensions at once on a given part. (Fig. 2)
- By interchanging charts, the same Projector can be used to check a variety of parts—bolts, flat-head screws, or socket screws. (Fig. 3)

Model 8 and other Kodak Contour Projectors can help simplify your measurement and inspection problems, too. For full details write for our illustrated booklet, "Projection Gaging with Kodak Contour Projectors," or ask for the name of the Kodak field representative in your area. He'll be glad to advise you.



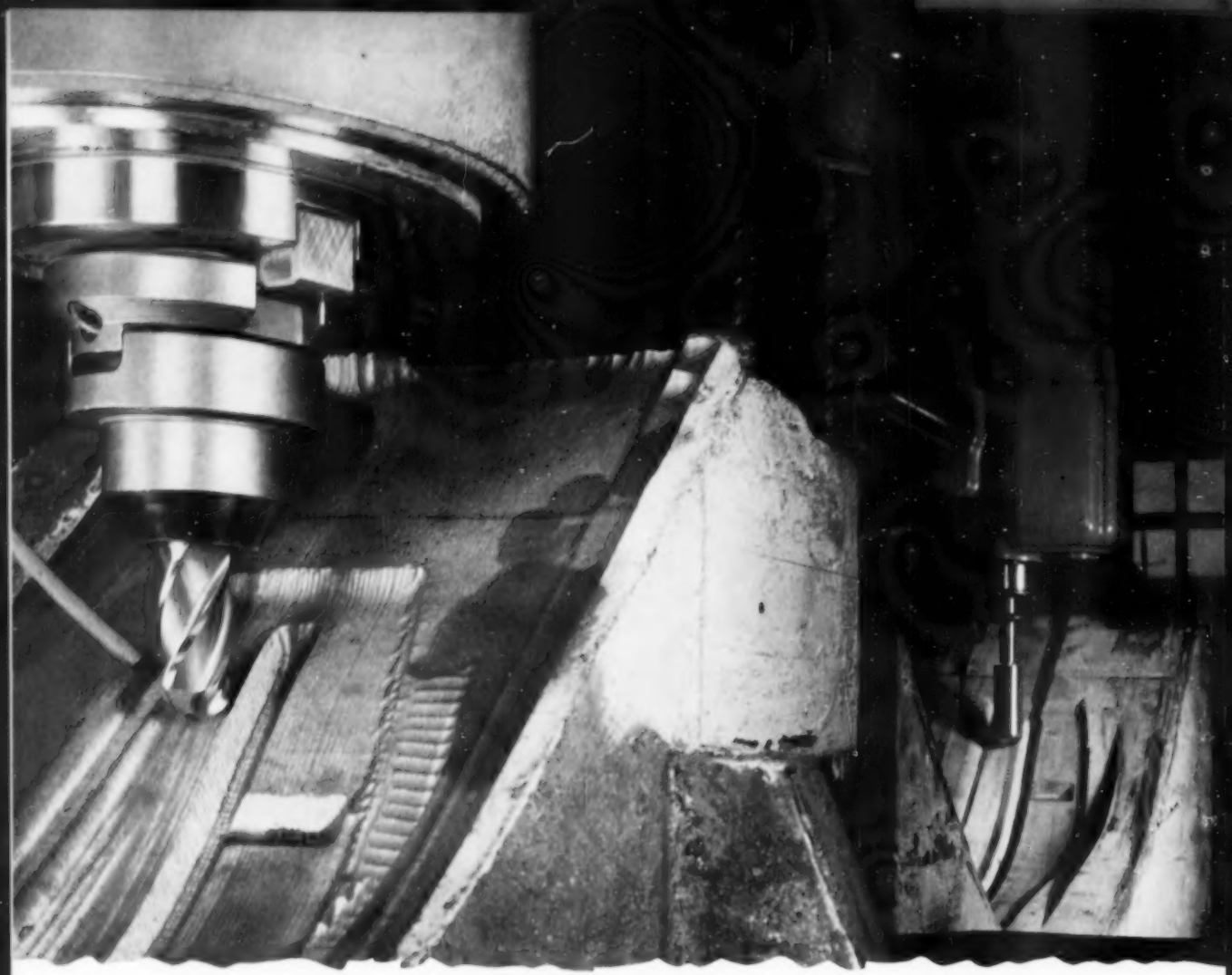
3–Here an operator uses a Model 8 Projector to check the root radius of threads to tolerances on the order of .002".

**EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

**Apparatus and Optical Division**

## the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK



# EFFICIENT MILLING...*in any direction!*

**New CLEVELAND 4-flute center cutting End Mills reduce individual end tooth shock and assure smoother cutting action, particularly in plunge milling.**

The advanced design of 4-flute 500 Series High Speed End Mills is your assurance of *accuracy* and *high production* in both tracer and general purpose milling. The accurately form-ground notches and the precision ground cutting edges give you absolute uniformity and *positive chip removal.* Try these new CLEVELAND End Mills on your next job. Get all the advantages of 4-flute mills *and plunge cutting, too!* Contact our nearest Stockroom, or . . .



BALL NOSE SQUARE END

In both the ball nose and square end types, the rake angle is uniformly progressive from zero at dead center to blend with the hook in the cutting face of the flutes.

***TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR***

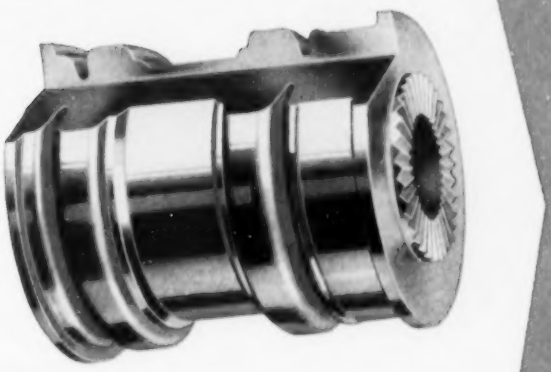
**THE CLEVELAND TWIST DRILL CO.**

**1242 East 49th Street • Cleveland 14, Ohio**

***Stockrooms:* New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58**

***E. P. Barrus, Ltd., London W. 3, England***

Everybody knows that
National Tool Company
makes circular form tools—





But did you know
we make surface
broach sections . . .

and more special cutting tools of all kinds
than any other tool manufacturer?

**For more than half a century National Tool Company has supplied high quality precision cutting tools to the metal working industry. When your job requires special cutting tools call your National Tool representative. His assistance is yours for the asking whether you're interested in one *special* tool or a complete tooling program.**

National Tools Cleveland

# National
## TOOL CO.
Cleveland 2, Ohio

*Representatives in major industrial centers*

## New FREE Catalog

**To National Tool Co., 11200 Madison Ave., Cleveland, Ohio**

Please send NEW 92 page catalog showing National Tool Company's complete line of *special* tools for the metal-working industry.

Name_____

Position_____

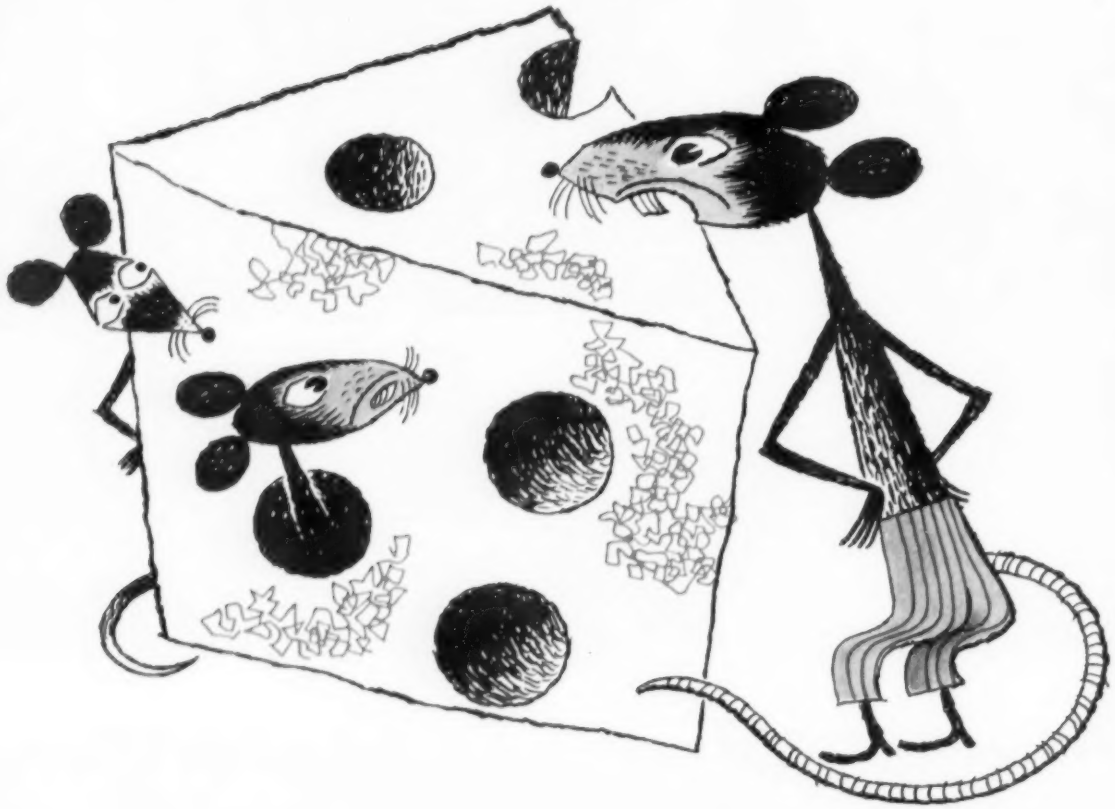
Company_____

Address_____

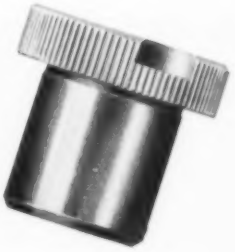
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# WHAT...

## NO UNIVERSAL DRILL BUSHINGS?



Wherever there are holes to drill using jigs or fixtures, it pays to specify Universal drill bushings. Machined from finest quality steel, Universal bushings have super-finished bores which lengthen tool life and reduce bushing wear over long production runs. Knurled heads provide quick, sure grip. Blended radii on top-inside diameters help prevent tool hang-up and breakage. Standard sizes and lengths in stock for immediate delivery.





**FREE UNIVERSAL SELECTOR. Gives all engineering data for selection of all types and sizes of drill bushings up to 1¾" drill size. Send request on your company letterhead.**

196

**UNIVERSAL ENGINEERING CO.** FRANKENMUTH 3, MICHIGAN



A job-proved Heller line

# Heller solid carbide Tools

*give more because they "give" less!*

**GREATER RIGIDITY PAYS OFF:** There's no spring or wobble as with carbide-tipped steel tools. So, longer life, higher speeds and smoother finishes are built into Heller Solid Carbide Tools.

**CHECK THESE SPECIFIC ADVANTAGES!** Heller Solid Carbide End Mills produce much finer finishes than tipped types. Heller Solid Carbide Drills increase production 40 to 50 times over high speed steel drills because of higher speeds. Heller Solid Carbide Reamers last as much as 50 times longer than steel reamers cutting hardened steels at Rockwell C-63.

**RESHARPENING SERVICE ADDS FURTHER LIFE!** Heller regrinds dull tools to restore them to original precision . . . at a fraction of their original cost.

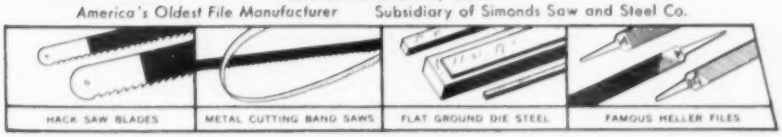
**COMPARE THE VALUE!** Tested against high speed steel tools with or without carbide tips, Heller Solid Carbide Tools clearly prove that they cost much less in the long run.



## Heller Tool Co.

NEWCOMERSTOWN, OHIO

*America's Oldest File Manufacturer* — Subsidiary of Simonds Saw and Steel Co.




## HOLLER FOR HELLER

*for better cutting at lower cost!*

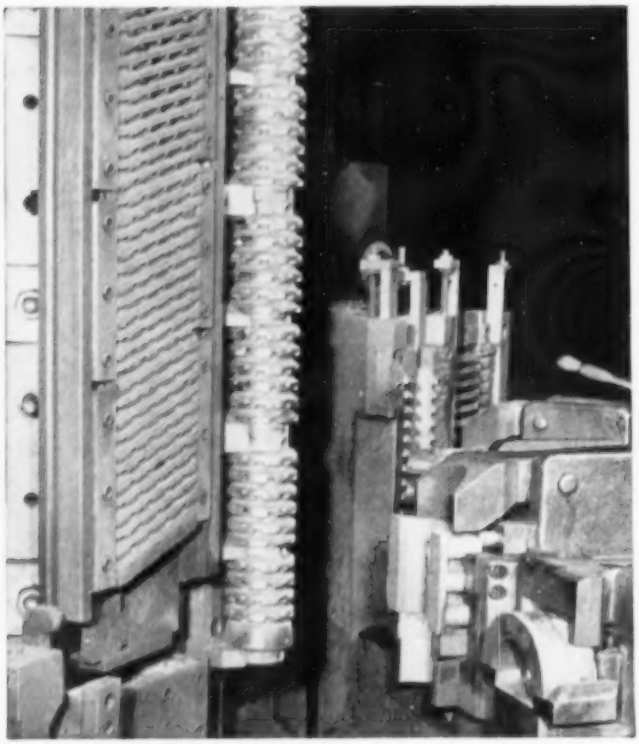
Whether it's solid carbide tools or job proved files you want, it pays to consider Heller first. **Oldest in filing experience, newest in cutting developments,** Heller is best equipped to match cutting tools to job requirements for maximum production at minimum cost.

**SOLD EXCLUSIVELY THROUGH**

Heller Distributors

"YOUR OUTSIDE TOOL ROOM"

SERVICE + STOCKS = SAVINGS



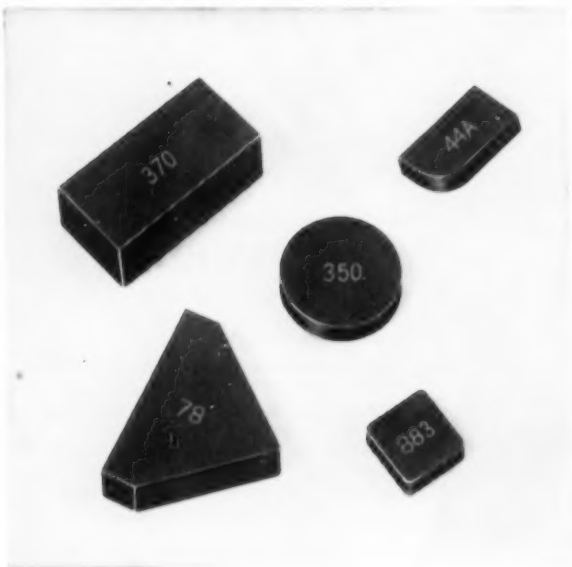
**Grade 883 increases broach life 2500%**

Highly abrasive cast iron used for this bearing cap at Studebaker caused conventional broaches to fail after maximum run of only 3,600 parts. After the switch to Grade 883, initial broach ran 50 days, produced 90,000 parts without service. Over-all machining costs were reduced 22%.

**Grade 370 saves 155 hours' machining time**

Normal machining time on this 165-ton cast-steel propeller runner at S. Morgan Smith Co. was 220 hours. Despite abrasive patches, and interrupted cuts, Grade 370 cut machining time to 65 hours – ⅓ the time. At 154 fpm, Grade 370 ran 30 hours without changing – compared to 6-8 hours with previous tools.

# WHY MACHINE OUTPUT GOES UP, WITH CARBOLOY® CARBIDES ON



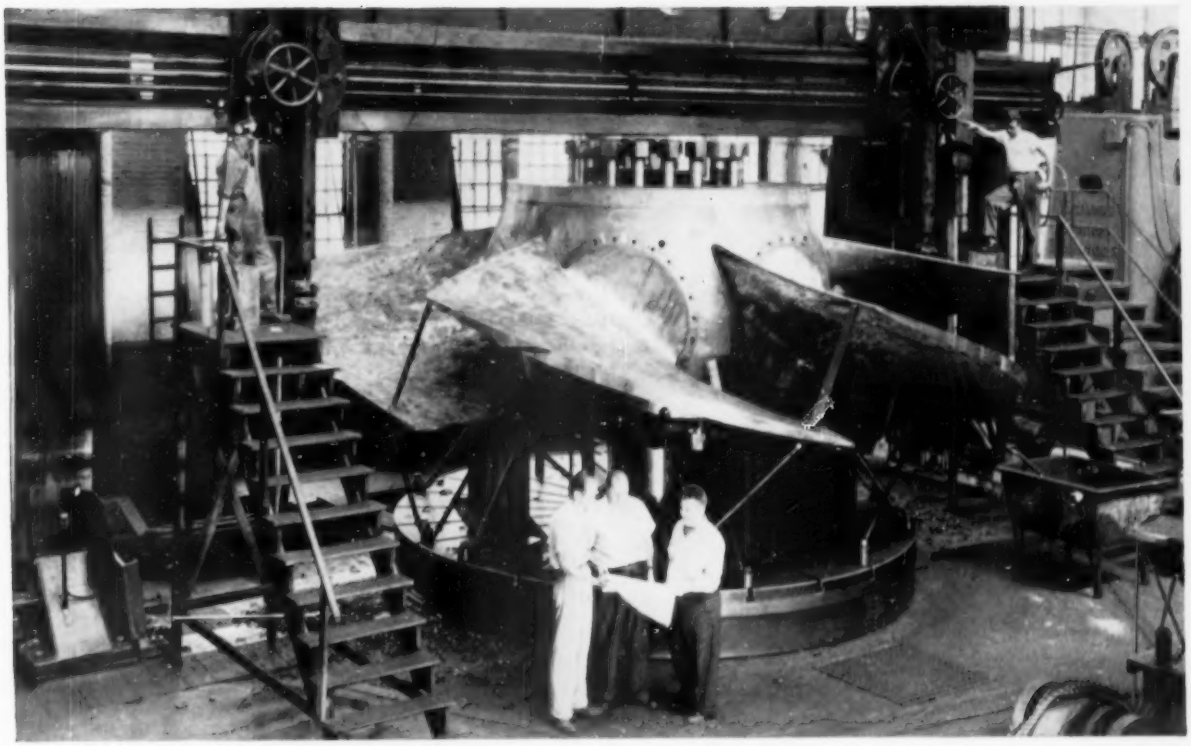

**Grades for cutting every material**

Eleven grades to choose from: 300 Series and 78 Series carbides for cutting steel; new Grade 860 for cast iron; five grades for nonferrous machining.



**. . . in a form for handling every job**

Standard tools in thirteen styles, hundreds of sizes; standard blanks in wide range of styles and sizes. Inserts for Carboloy toolholders or other standard types.



# AND UNIT COST COMES DOWN, YOUR METALCUTTING JOBS

- Carboloy cemented carbides are tailored to the job
- Let you cut faster without sacrificing tool life

You'll increase the productivity of your machines, while you reduce total manufacturing cost per piece, when Carboloy cemented carbides go to work on your jobs.

Your machines will be more productive, because they can operate at greater speeds and feeds when tooled with the Carboloy grade designed for the job. And they'll produce more per shift, because Carboloy carbides take rugged machining conditions without sacrifice of tool life.

Your units costs will go down, because the use of these grades means less machining time per piece . . . with lower downtime expense, reduced grinding and maintenance charges.

**Proved in the field**

Hundreds of inplant case histories like the two shown above prove Carboloy cemented carbides can double and triple output, save thousands of dollars per year in machine time, manpower, and tool costs.

The reason is simple. Each Carboloy carbide grade has cutting characteristics tailored to a particular type of job. Whether you're machining ferrous or nonferrous metals, whether you're taking heavy or finishing cuts . . . one of the eleven Carboloy carbide grades handles the job. And you can quickly get the *grade* you need, in the *form* you need it.

**Stocked locally by Carboloy Distributors**

Your local Authorized Distributor of Carboloy cemented carbide products stocks standard tools, blanks, inserts, and toolholders in styles and sizes for every job or machine. He'll give you fast delivery, and expert technical assistance.

Call him today (you'll find his name in the Yellow Pages of your phone book). Or write: *Metallurgical Products Department of General Electric Company, 11101 E. 8 Mile Blvd., Detroit 32, Michigan.*

**CARBOLOY®**
CEMENTED CARBIDES

**GENERAL ELECTRIC**



The formed metal stamping illustrated above is produced complete on the U. S. No. 33 Multi-Slide Machine shown below.

# ON FORMED STAMPINGS REDUCE COSTS WITH U. S. MULTI-SLIDES®

If you produce formed metal stampings, the U. S. Multi-Slide may be the answer to your cost reduction problems. The part illustrated is just one of the many different types of stampings that can be produced complete on the U. S. Multi-Slide — without secondary handlings . . . and every such operation that can be eliminated increases your profit potential.

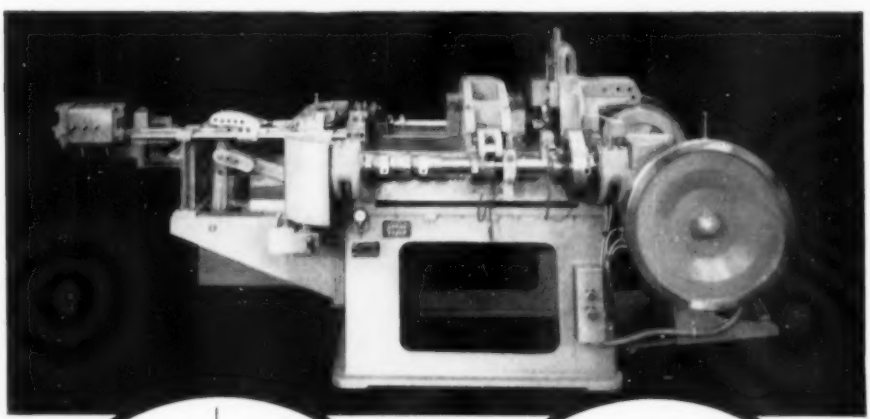
The combination of ram action, four-slide forming, vertical stripper and various auxiliary units allows for the designing of tools to produce intricate parts complete — without secondary operations. Since these movements are an integral part of the machine equipment, it is not necessary to incorporate complicated movements into the dies themselves, thereby giving the added advantage of reduced tool maintenance cost.

Investigate! Ask for a copy of Bulletin 15-T, or send us part drawings or samples for our recommendations.

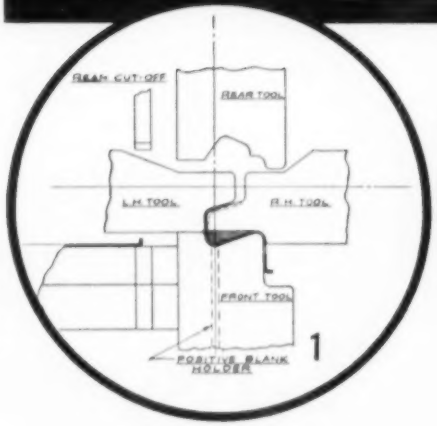
## U. S. TOOL COMPANY, Inc.

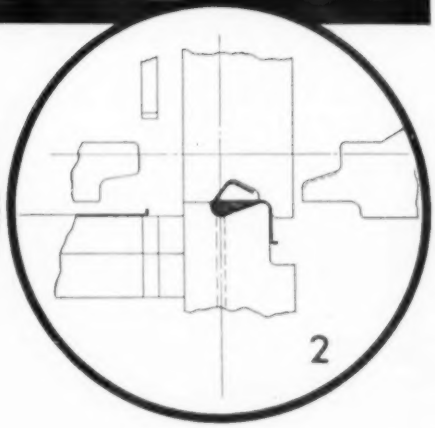
**AMPERE (East Orange)** **NEW JERSEY**

Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

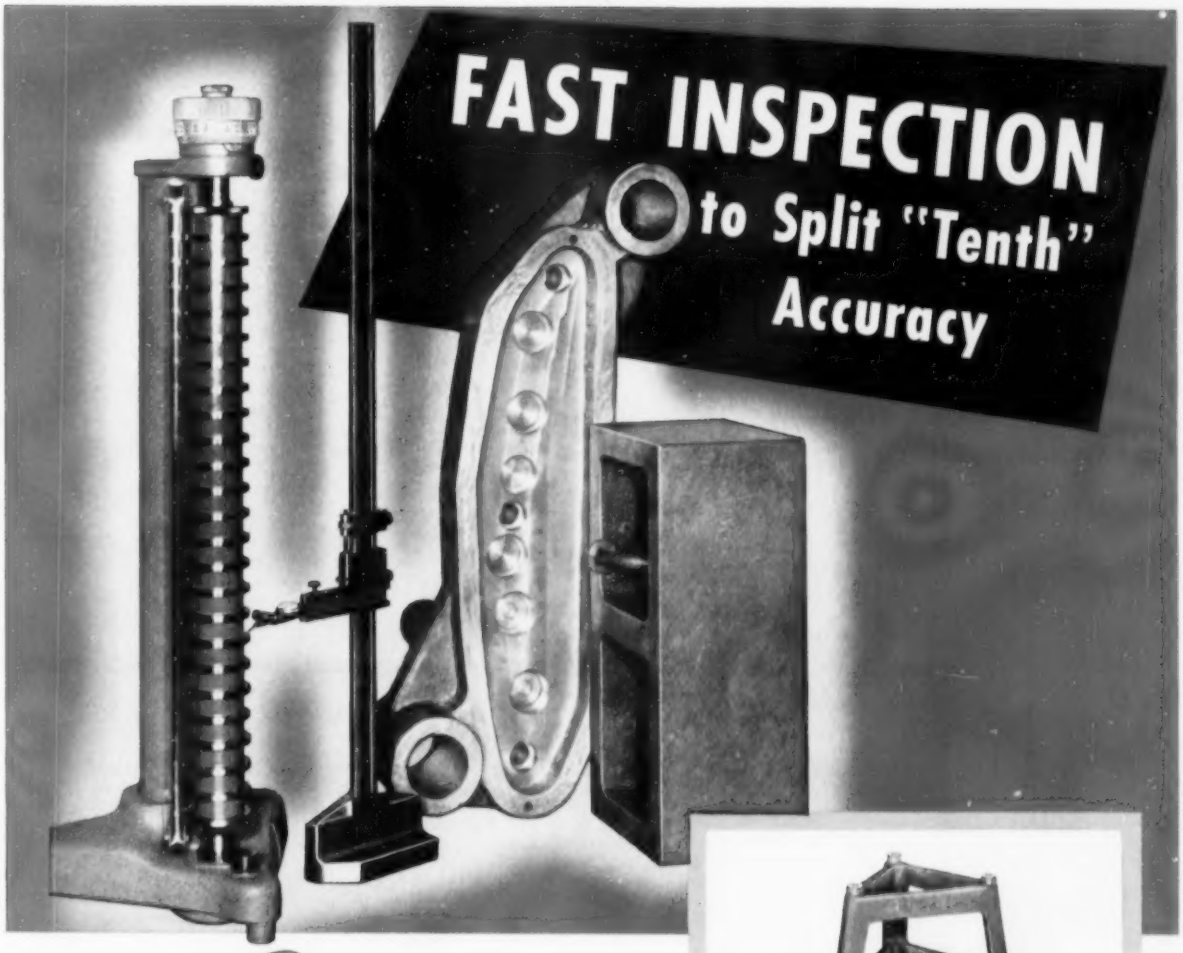


Right: The No. 33 U. S. Multi-Slide with capacity for material up to 2½" wide, with feed length adjustable up to 12½".




Right: Operations in the forming position. 1 — Front, right-hand and left-hand tools entered to preform part around post. 2 — Right-hand and left-hand tools retracted; front and rear tools entered to complete the form.




# Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24" range to limits of less than .0001". No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!



**Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6" and 12" models for smaller jobs, to the 18", 24", 36" and 48" models for larger inspections. Precision-made risers in 6" and 12" sizes, such as the 12" model for the 24" PLA-CHEK shown above, may be used with all PLA-CHEK Gages.**

**MAIL THIS COUPON FOR COMPLETE DATA**

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Cadillac
**GAGE COMPANY**
**P.O. BOX 3806 • DETROIT 5, MICHIGAN**


FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-63

# DROODLES

by ROGER PRICE





*Bench Model BC-7C*



*Floor Model FC-30*



*Floor Model FC-14*

## "LEFT-HANDED MONKEY WENCH"

Her name was Yvonne, and I won her in a crap game in Greenwich Village. She was a winsome little thing, and at first we got along famously. She was a good housekeeper, and her cooking wasn't half bad, if you like a steady diet of banana fritters, banana bread and banana pudding. Some people would call Yvonne talented, I suppose, but frankly, she had lots of faults, too, like singing off-key, and lacing my beef stew with absinthe. Finally, when she started nagging me and sneering at my sparkling witticisms, I got fed up and gave her to my worst enemy. Now they're both on TV, making a fortune, and I'm back doing my own typing again.

Without monkeying around any further, I'd like to give you a few facts on Jones & Lamson Optical Comparators. These precision-built instruments are on the job throughout industry, keeping quality control high by rapidly and accurately measuring and inspecting all sorts of parts and objects. The J & L Comparator's speed, accuracy (to .0001") and ease of operation make it equally valuable for both production line and small-lot work. Investigate how the J & L Comparator can help keep production quality high, and scrap low, in *your* plant. Available in eleven bench and floor models. For complete information, write Dept. 710 *today*.

## JONES & LAMSON OPTICAL COMPARATORS *On the Job . . .*



***at New Milford Carbide Tool Co., Hackensack, N.J.***

J & L Comparators speedily and accurately check angles, radii, contours and linear dimensions of precision carbide and H.S.S. form tools, thereby assuring conformance with specific customer requirements.

***at American Coldset Co., Paterson, N. J.***

The rapid, precise inspection of special and standard industrial diamonds, by means of J & L Optical Comparators, safeguards the maintenance of high quality standards.



*"The originator of machine tool standards in optical inspection"*

# JONES & LAMSON

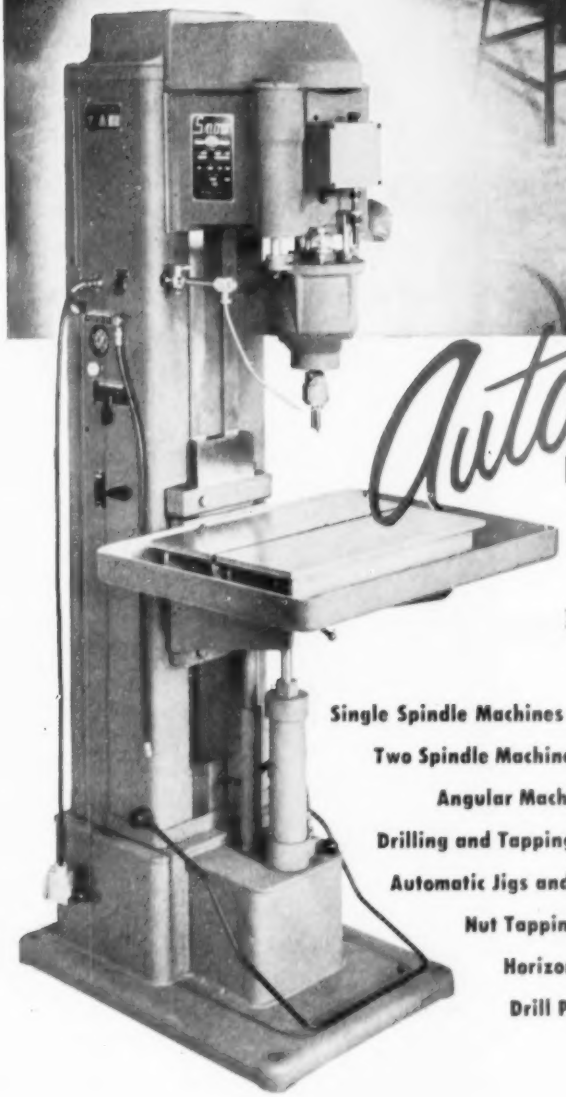
JONES & LAMSON MACHINE COMPANY, Dept. 710, 518 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

name _____ title _____ street _____

company _____ city _____ zone _____ state _____





*Automatic*

## FULL-UNIVERSAL MACHINES
## for
## DRILLING—TAPPING—THREADING

Batteries of Snow machines are found in many plants where high production output must be combined with quick set-up, low tooling cost, and the highest degree of accuracy.

A section of the second operation department of the REVERE CAMERA COMPANY is shown where the precision components for REVERE cameras and projectors are processed.

Where "quality" of product is of extreme importance, the decision is to standardize on Snow equipment.

**Single Spindle Machines**
**Two Spindle Machines**
**Angular Machines**
**Drilling and Tapping Units**
**Automatic Jigs and Fixtures**
**Nut Tapping Machines**
**Horizontal Machines**
**Drill Press Tap Heads**

# SNOW
MANUFACTURING COMPANY

435 EASTERN AVENUE, BELLWOOD, ILL.
(Suburb of Chicago)

# $7200 per month saving by large automotive plant after switching to



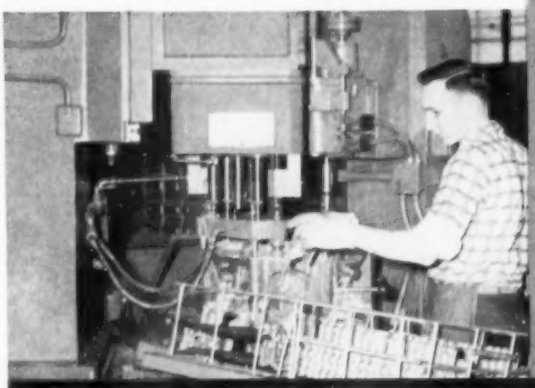

# DASCO D-20

## HEAVY-DUTY SOLUBLE OIL

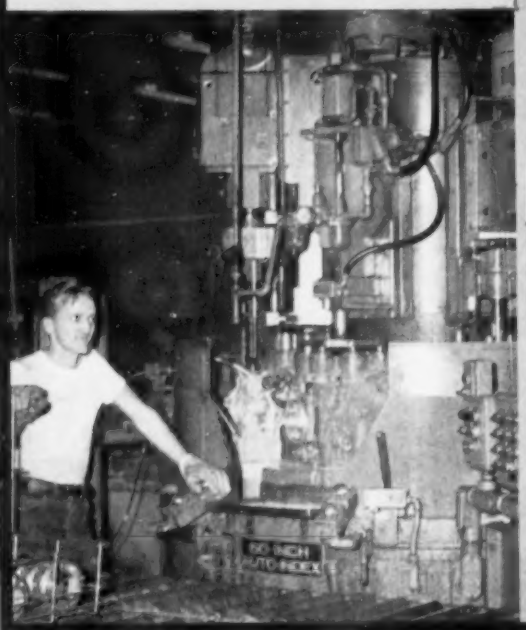
An actual saving of $7200 per month, including labor costs, has been reported by a large automotive transmission plant since switching to Stuart's Dasco D-20—*the first truly heavy-duty soluble oil* formulated and priced for general application!

ONE OIL FOR 365 DIFFERENT MACHINES—This carefully engineered compound eliminates cutting oil confusion—drastically reduces the number of cutting fluids needed in your plant. This plant uses economical Dasco D-20 in standard mixtures on *365 different machine tools*—reducing cutting oil inventory . . . saving service time and cutting oil costs . . . minimizing chance of error—yet taking advantage of all lubricating and cooling properties you expect from a heavy-duty soluble oil.

RANCIDITY ELIMINATED—This user reports that Stuart's Dasco D-20 stays sweet longer—even after long shutdowns. Rancidity is actively resisted by a special germicide additive, the best of a very few germicides that remain effective in the presence of soaps. Stuart's Dasco D-20 has superior wetting ability—remains effective when mixed with water.



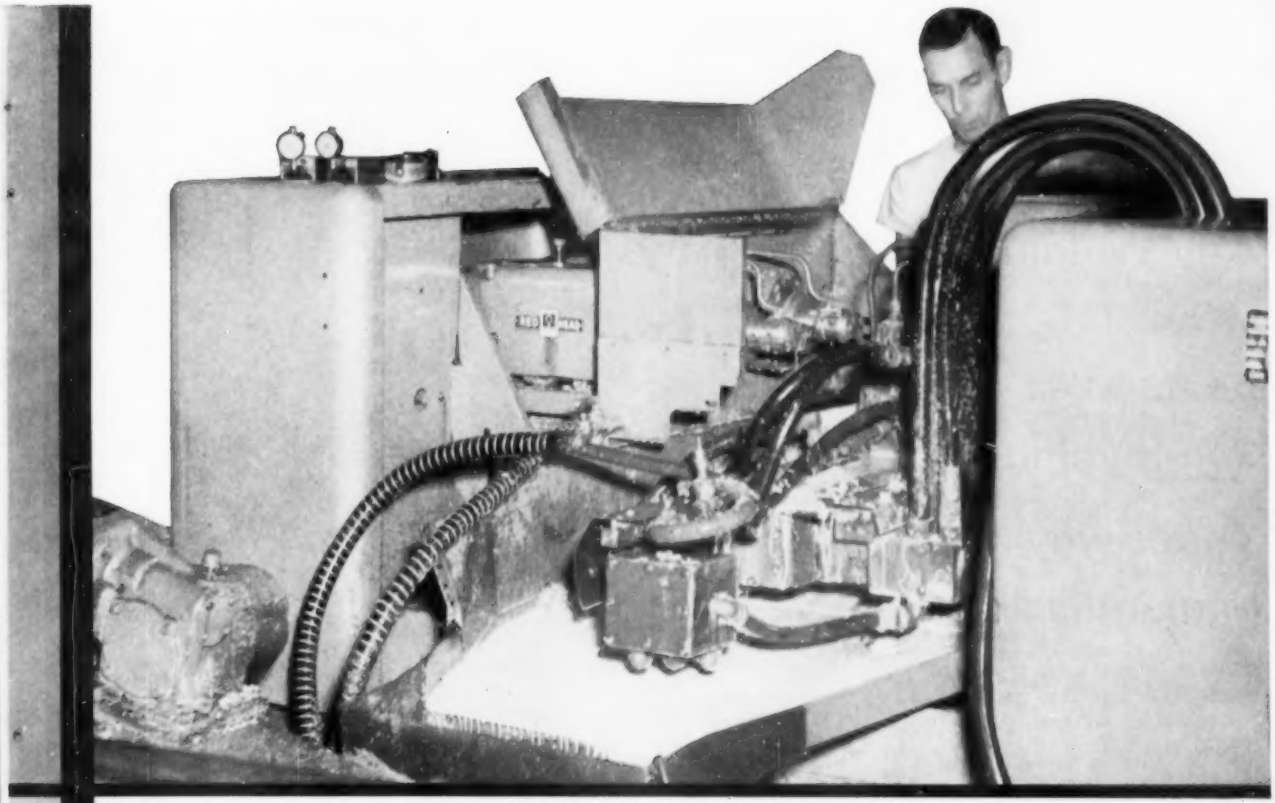
Chips settle faster with Stuart's Dasco D-20, so you have a clean compound in your machine at all times. You get a better finish . . . cooler cutting and grinding.



You can use low-priced Stuart's Dasco D-20 for reaming, boring, drilling, facing, chamfering, milling, tapping, threading, broaching, surface-grinding, and high-speed carbide tool machining.

## For Cutting and Grinding

Stuart's Dasco D-20 maintains or improves efficiency of your cutting and grinding operations. A real heavy-duty emulsifiable oil, it forms a tough, thin film between the cutting tool and the work . . . reducing friction and preventing excessive heating. A wide variety of tough metal-cutting operations, including certain types of broaching, can be done with this *one* low-priced compound. A lean mixture for grinding enables you to take full advantage of improved wheel bonds. Properly applied, it allows you to use high-unit pressure for maximum stock removal . . . keeps wheels open and free-cutting . . . prevents heat checking.



## First low-priced heavy-duty soluble oil with both additives: active germicide and E. P. base

Stuart's Dasco D-20 is the first low-priced soluble oil to offer you both a special anti-rancidity germicide and an extreme pressure base oil additive with high anti-weld and lubricity characteristics. Carefully balanced, high-quality emulsifying agents provide high-grade cooling properties . . . unusual stability for longer life. This multi-purpose, heavy-duty soluble oil gives you ideal characteristics for high-speed machining with carbide cutting tools . . . upgrades finish and tool life on tool steel applications. Stuart's Dasco D-20 has superior wetting ability . . . avoids rust . . . mixes easily . . . keeps machines and parts clean . . . and is preferred by operators.




Phone your
Stuart Service Center

Arrange now to test Stuart's Thermex 33 Hot Die Lubricant on your difficult forging and drawing operations.

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*Representatives in all principal cities*

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2729 South Troy Street, Chicago 23, Illinois
**CANADIAN D. A. STUART OIL CO., LIMITED**
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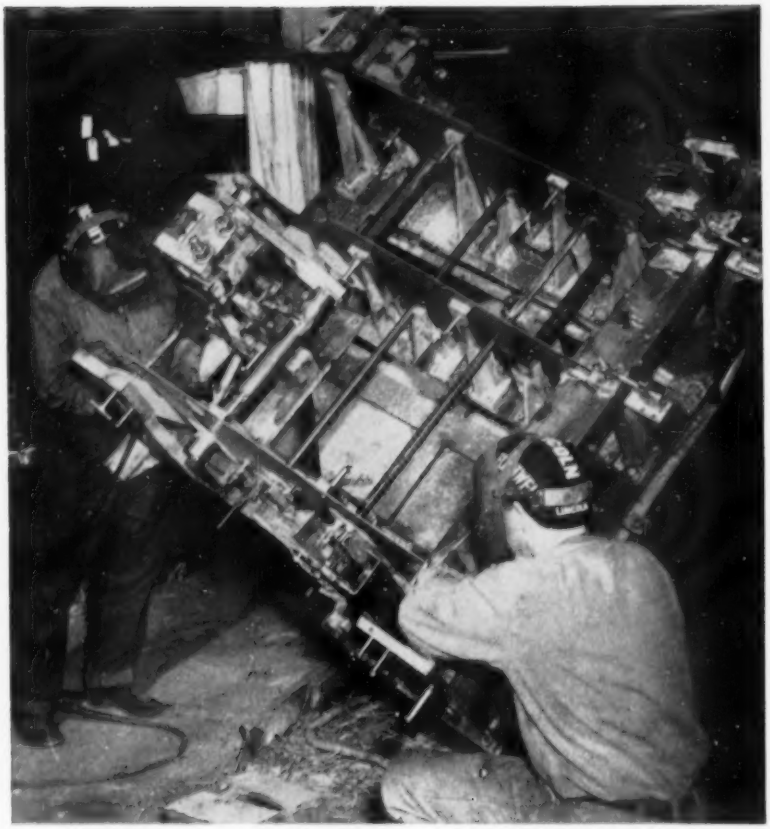
Stuart

**METALWORKING LUBRICANTS**

Any Welding Job
AC or DC can
be handled with
one machine

That's why it pays
to standardize on

# LINCOLN IDEALARC



*This job required DC welding . . . The next job needed AC.*

WITH Lincoln Idealarcs you can schedule any welding job on any machine. You can take any machine to any job. You can do these things because every Idealarc can give you both AC and DC welding current . . . whichever is best for the particular job.

Hadn't you better standardize on Idealarc? Write for Bulletin SB-1343 and SB-1364 for facts.



*Idealarc AC/DC Welder available in 180, 250, 300, 400, 500 amp. sizes.*

**THE LINCOLN ELECTRIC COMPANY**
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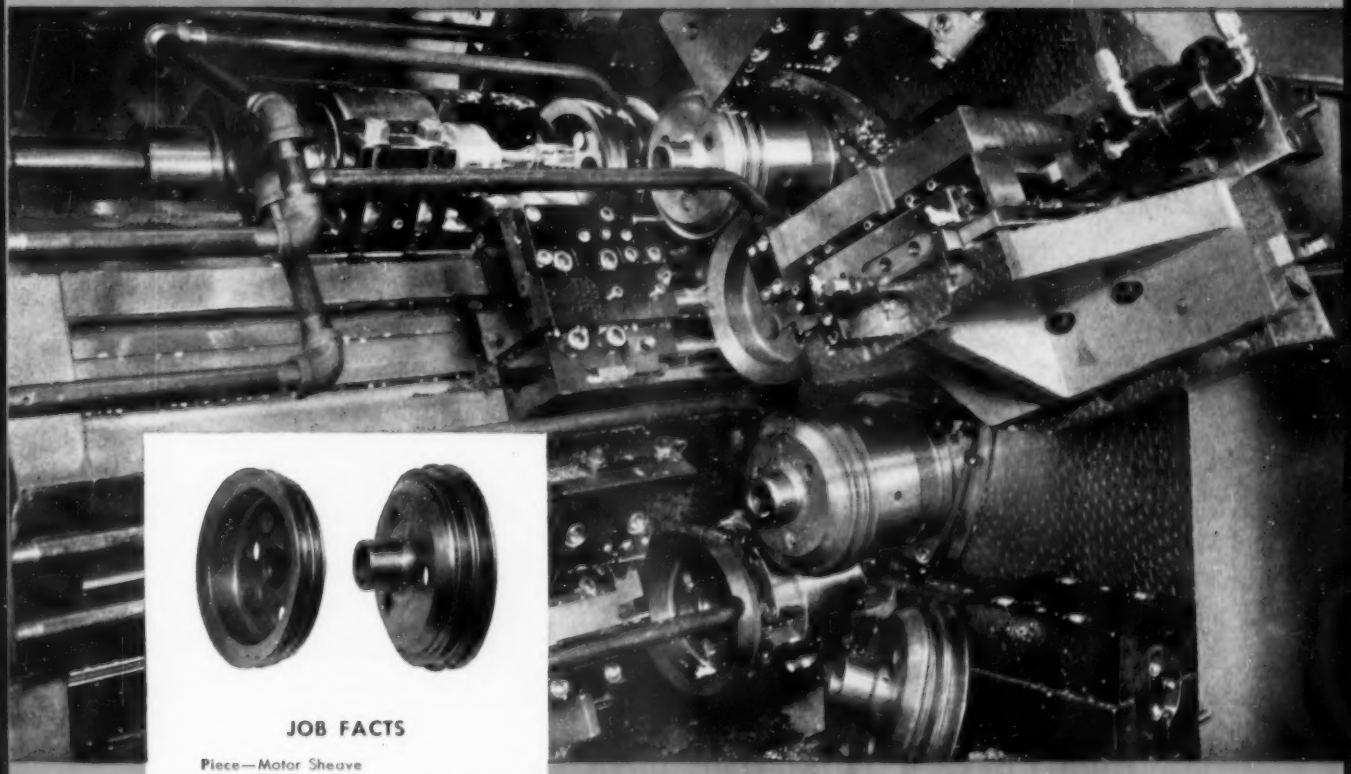
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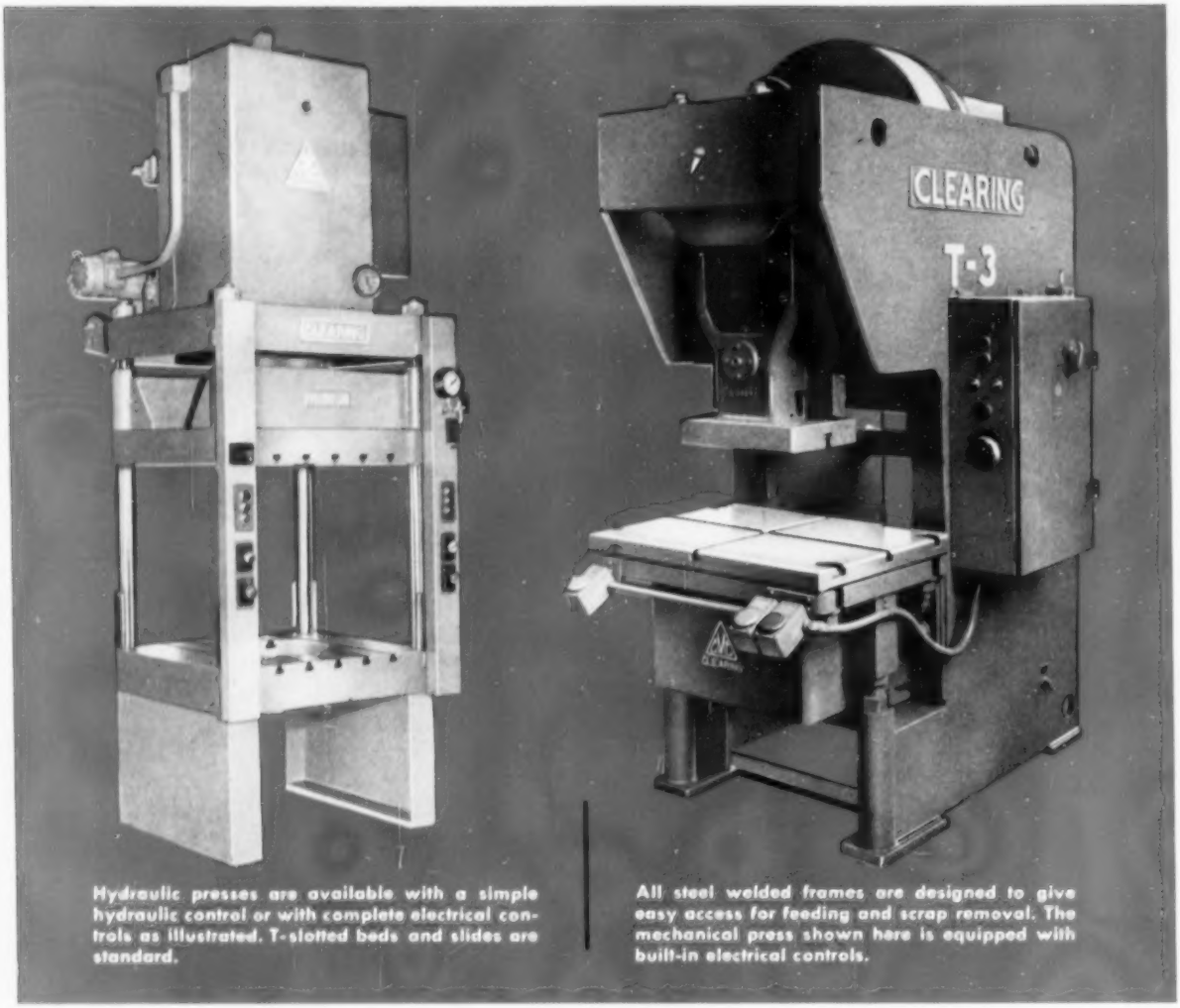
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## It's Time to Run!

In all human affairs and relationships, you have to learn to walk before you can run. Our society has been an organized and functioning institution for 25 years now and during that time we have learned to walk. We have learned to walk well and are now in a position to start running.

Our avowed purposes have been to advance scientific knowledge of tool engineering, provide means and methods of applying such knowledge in practice and in education, and disseminate such information. We are organized into national administrative committees, with local chapter counterparts, to make certain that each of our purposes is considered. Our officers and the board of directors watch the progress in all areas to keep the society moving forward with a balanced program.

We have an active research program that is sifting known information on tool engineering and filling in gaps. Programs at annual meetings are bringing together tool engineers and fresh ideas. Our magazine is recording noteworthy progress in all phases of tool engineering. Preparation and publication of handbooks is an increasing activity. Also, representatives of the society are working in the fields of professional engineering and standardization.

Our present standing in each of these activities has been preceded by a period of exploration, study and thought. Progress was slow at first. As the committee involved spelled out its problems and determined its goals, action increased. When activity became still greater, a staff administrator was appointed. At a certain level, it became apparent that professional help would be required to increase the pace. Knowledge of tool engineering alone was not sufficient.

To maintain balance among the society's current programs, concentrated effort is now being turned toward education. The National Education Committee has increased its activity, it has a staff administrator and now it has a professional educator as director. The actual functions of this man have not been spelled out. He is being given room to develop his activities in the best way, based on his knowledge of education and the committee's knowledge of tool engineering and its needs.

Together, the committee and the education director, will now start to run. They will coordinate present plans for helping tool engineers to help themselves professionally. They will work out formulas for successful seminars and courses, and they will increase their efforts toward building college and university curricula that will produce good tool engineering graduates.

H E Collins

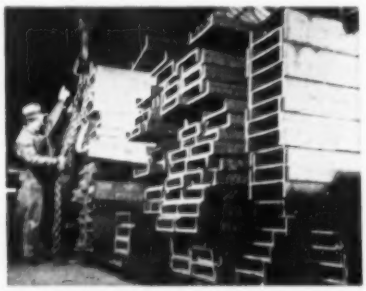
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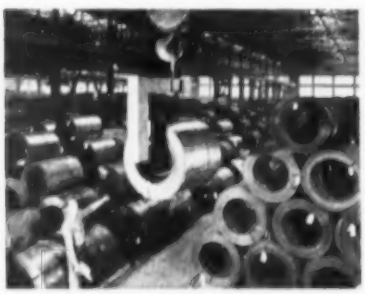
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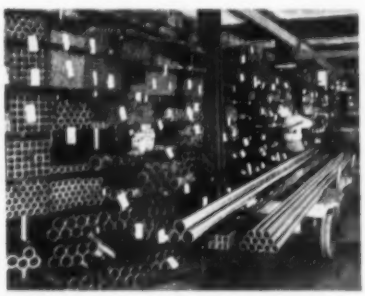
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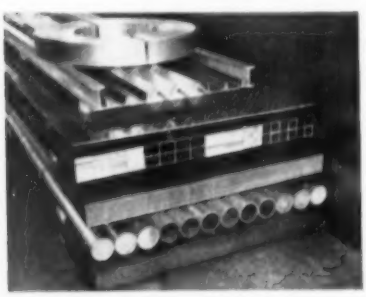
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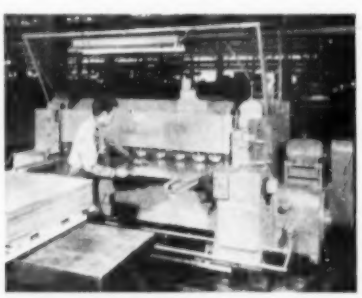
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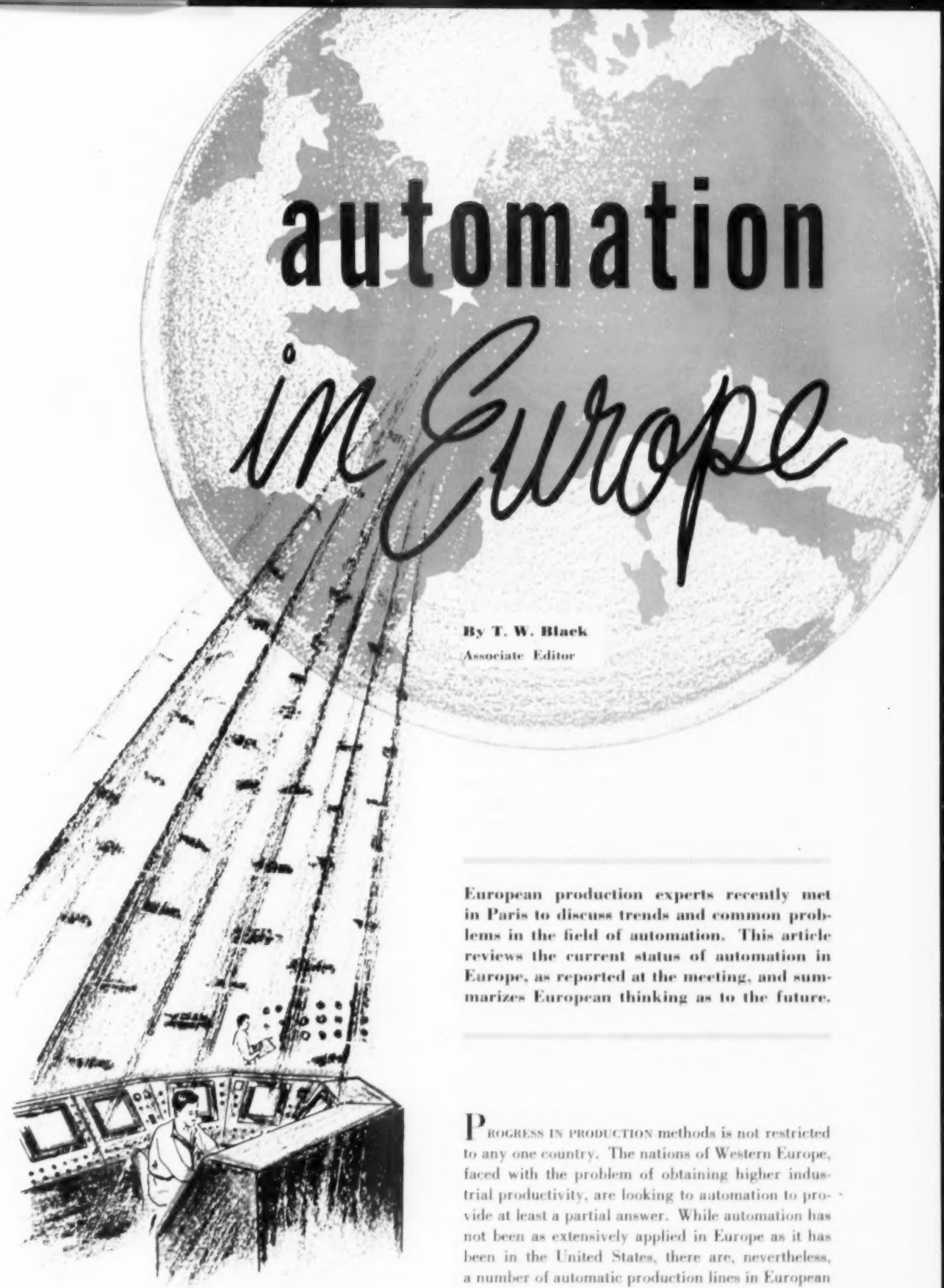
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# automation in Europe

By T. W. Black
Associate Editor



**European production experts recently met in Paris to discuss trends and common problems in the field of automation. This article reviews the current status of automation in Europe, as reported at the meeting, and summarizes European thinking as to the future.**

PROGRESS IN PRODUCTION methods is not restricted to any one country. The nations of Western Europe, faced with the problem of obtaining higher industrial productivity, are looking to automation to provide at least a partial answer. While automation has not been as extensively applied in Europe as it has been in the United States, there are, nevertheless, a number of automatic production lines in European

plants and interest in automation is at a high level in the United Kingdom, France, Germany, Italy, Belgium, Sweden, Norway and other countries.

### What is Automation?

There is no general agreement on a definition for the term "automation." All countries agree that automation in manufacturing is an evolutionary development, coming about through improvements in mechanization, accompanied by improvements in control devices. The automatic factory, theoretically possible, is not yet in sight.

In a fully automatic factory, as pointed out by United Kingdom engineers, all operations would be regulated by a central control station. This station would perform all production control functions; that is, it would analyze sales, orders and market information, combine this with policy decisions by management, and print a master production schedule. It would control the flow of raw materials through processing operations and would also keep an adequate supply of finished parts at assembly stations. All of these production control functions could be performed by an electronic computer. With all processing, inspection and assembly operations performed automatically, there would be no need for human intervention except for maintenance.

### Applications

Full automation, then, involves computer control of automatic processing and assembly machines. Manpower requirements are limited to maintenance personnel, possibly some clerks, and management.

Manifestly, full automation of a plant must be deferred until all elements of a production line—machining, inspection and assembly operations—have themselves been successfully automated. In Europe, as in the United States, substantial progress has been made along this line.

**Machine Tools:** In general, production lines in Western Europe are equipped with the same types of machine tools found in comparable factories in the United States. With the exception of centerless grinders, however, few of these tools are equipped with feedback controls to provide self-correcting features. Many of these machines are loaded and unloaded by hand; others are fed by manually-loaded magazines. Thus there are not too many examples of automation to be found among the standard machine tools.

Rotary indexing machines of various types are common in the United Kingdom and Germany and, to a lesser extent in other West European countries. These machines are occasionally linked with conveyors and automatic handling equipment to make up a line having minimum direct labor requirements.

In-line transfer machines have long been in use in Europe, particularly in the automotive industry. The first transfer machine in Europe, possibly the first in the world, was built by Morris Motors in Coventry, England in 1924. It produced cylinder blocks from rough castings. Since that time, many transfer machines have been built in England, France and Germany and most of these are indistinguishable in design from those built in the United States during the same period.

Gaging stations and other in-process control stations are frequently built into European transfer machines, providing a degree of feedback control. Where there are a number of successive production operations, it is not unusual to link individual transfer machines together with shuttles, turntables or other automation equipment to make up a fully mechanized production line. The problem of economic automatic tool changing has not as yet been solved and most European plants rely on planned periodic shutdowns for tool changes and routine maintenance.

There is one significant difference between European and American rotary index and transfer machines: most European machines are built up from standard components. This type of "building block" or "unitized" construction has recently come into prominence in the United States because it has been found that a highly specialized machine, designed for a specific product, may be rendered obsolete by a product design change before its useful life has expired. When standardized machine bases and heads are utilized, conversion to a new product is simplified. The changeover can be readily accomplished by rearrangement of various machine units.

**Programmed Machines:** Three-dimensional tracer-controlled machines for die-sinking have been in use in Europe for many years. Control of such machines by means of punched cards, magnetic tapes and the like is a relatively new development in both the United States and Europe. There are few, if any, machines of this type on the Continent. In England, Ferranti has produced a tape-controlled milling machine and work is proceeding on a cam-milling machine controlled by an analog computer. Given a series of coordinates, the computer determines the best curve through all points and guides the cutting tool accordingly. This machine is being developed by Electrical and Musical Industries in cooperation with Cincinnati Milling Machine Co.

**Automatic Assembly:** There are a number of interesting automatic assembly machines in Western Europe. These machines are comparable to those developed in the United States in general design and function. In Germany, a rotary-index ma-

chine has been developed for the assembly of electrical plug sockets. Some of the parts assembled are manufactured on the assembly machine itself, which also incorporates test equipment. Resistors, contact assemblies and electrical switch gears are assembled automatically or semiautomatically on other German machines, as are printed circuits and sockets for electron tubes.

An outstanding example of "do-it-yourself" tooling for automatic assembly is found in the AB Ifoverken plant in Sweden. In this plant, electrical fuses are manufactured in volumes of some 20 million units yearly. The fuses consist of a ceramic body, top and bottom contact rings, top and bottom contact caps, a pressure spring and indicating wire, a fuse and an asbestos insulator. These components, plus a sand filler material, were formerly assembled manually. Approximately 220 girl operators were required for assembly operations. With the introduction of automatic assembly techniques, 35 workers produce a greater number of fuses than was previously turned out by the 220 operators. The extra operators were re-assigned to other work in the plant.

The machine is of the transfer type, with parts being carried between successive presses and welders on a conveyor. Precise positioning of parts for assembly is accomplished by means of levers, actuated from a main shaft. At the start of assembly operations, ceramic bodies are manually fed onto the conveyor. From this point, all assembly and testing operations are automatic.

Development costs for the machine were low. A step-by-step analysis of each hand operation was made and a wood-and-sheet-steel model was designed and built to replace the operation under consideration. When this model was functioning satisfactorily, a metal prototype model was built. All of the models were constructed by one craftsman, working under the supervision of an engineer. The assembly machines themselves were also built in the plant.

In addition to reducing direct labor costs, it has been found that rejects on completed fuses amount to 0.5 percent as compared to 6.0 percent when fuses are assembled manually. There have also been significant savings on wire and other materials, due to more efficient production.

**Standardized Products:** The assembly of electrical fuses offers an ideal opportunity for automation. Large quantities of identical products are required and, since these products are standardized, there is no possibility of product design changes which would render automatic machinery obsolete. In many instances, however, product volumes in Western Europe are not as high as in the United States. Hence, automation may not pay.



**NEVIN L. BEAN, a long-time ASTE member, was invited by the U. S. State Department to serve as an observer at the Paris Automation Conference. Mr. Bean is technical assistant to the general manager, Automatic Transmission Div., Ford Motor Co. and is a nationally recognized authority on manufacturing planning, including automation. THE TOOL ENGINEER is indebted to Mr. Bean for his comments on the Conference.**

One solution, noted by the German delegation, is to reduce the number of designs of a given product. There were at one time, for instance, over 1000 types of domestic cooking vessels available on the German market. Research disclosed that only about 50 types were in general use, and that housewives were willing to accept an even smaller variety. It is evident that standardization, in this case, would ultimately lead to lower costs by permitting larger production runs of each type. This type of standardization, when applied, may well extend the number of automation applications in Europe.

### Effects of Automation

In Europe, as in the United States, the advent of automation has brought new problems, and has made it possible to foresee many more. Much effort has been devoted to finding solutions to these problems before they become acute.

**Displacement of Labor:** Unemployment due to automation is not a significant problem in Europe because automated production lines constitute only

a small percentage of the total productive capacity. In Germany and England, automization has been accompanied by greatly increased consumer demand so the number of workers required in individual plants has not been reduced. Further, there is "overemployment" in both of these countries at the present time. This fact in itself is sufficient to stimulate the application of automation, since the only way to increase over-all productivity is to increase the productivity of the individual worker.

**Need for Training:** It was pointed out by the United Kingdom delegation that, although automation saves labor on the whole, at the same time it creates a greater need for skilled technical manpower. One of the major obstacles to further automation in industry may well be a shortage of technicians and engineers. In both Germany and England, studies are under way to determine future requirements for technically trained manpower. At the conclusion of the studies, suggested curricula will be developed. It is significant that these curricula visualized in the United Kingdom are of two kinds: one for technical specialists in the various fields of automation and one for mangement of plants where automatic processes are used.

The German delegation pointed out that highly specialized engineering training in one branch of automation is not enough. Automatic processes in a plant are so closely related that a specialist in any one field must have training in fields which impinge upon his own.

Broad and comprehensive shop or vocational education is considered to be a necessity for workers in automated plants. Such broad training facilitates further training in specialized fields and gives an employee sufficient background so that he can be transferred to a new job and quickly retrained when necessary.

In extensively automated plants, maintenance workers occupy key positions and require more technical training than formerly necessary. The scope of an individual job in maintenance of automatic metal processing machines, for instance, embraces not only a knowledge of tools and machinery, but also a knowledge of mechanical engineering, electronics, hydraulics and kinematics.

To summarize the European view on training, the continued extension of automation is dependent upon a supply of trained engineers, technicians, mainteance men and other employees, as well as management training in automation problems. The training problem is not unlike that found in the United States.

**Management:** The key function of management in any type of plant is, of course, to make decisions. Many of these decisions are long-range, and the importance of long-range planning will increase with automation. There are a number of reasons for this, as pointed out by several countries at the conference. First, an automated plant is relatively inflexible. It cannot be readily changed over to a new product if the market for its product fluctuates or disappears. Second, automated plants represent heavy capital investments. The problem of obtaining an adequate return on this investment through efficient operation and full utilization of facilities can be solved only through accurate planning. Third, an automated plant is inherently more complex than a conventional plant, involving a high degree of coordination, and this, too, is a planning problem.

Where extensive automation is involved planning must be approached in a systematic manner, and decisions must be based on full data. German and English authorities point out that there are several tools which can—and, indeed, must—be used by management in short-range and long-range planning for highly-automated plants. Computers are one such tool. They make it possible for management to have full information on sales, inventories and other factors which affect important decisions. Previously, this information was not available early enough for effective—and timely—action by management.

The techniques of operations research are another tool for effective planning and control. The United Kingdom delegates listed several areas where operations research can be profitably applied in an automated plant. These are: studies of wear, breakdown and other factors affecting machine performance; studies of the pattern of demand for the output of a plant; studies of inventory and scrap records; and determination of product mixes in order to establish the most economical utilization of equipment.

Computers and operations research are of greatest utility when a plant is in actual operation. The German delegation pointed out that automation calls for basic market research as well. Before investing large amounts of capital in relatively inflexible machinery and equipment, management must be sure that there is a substantial market for the proposed product. Going a step further, the German report mentions the need for extensive advertising programs to promote consumer acceptance of standardized products and to create a desire for new products.

Will automation affect the structure of management itself? European authorities note a trend toward more centralized management as a consequence of automation applications. They expect this trend to continue because of the need for coordinated planning and fast action by management at top decision-making levels.

## Organization for European Economic Cooperation

**In the world today, there are three focal points of economic and productive activity—the United States and Canada, Russia and its satellites, and the free nations of Europe. Political, tariff and linguistic barriers—to say nothing of two major wars during the twentieth century— have prevented Western European nations from functioning as a fully effective collective economic unit. Ten years ago, the then Secretary of State, George C. Marshall, suggested that all European nations meet to draw up a program for the economic recovery of Europe from the effects of World War II. In response to Secretary Marshall's request, fourteen nations met in Paris in 1947 and set up the Organization for European Economic Cooperation.**

**The OEEC is now a permanent body, receiving financial support from member nations and from the U.S. Government. One of the branches of the OEEC is the European Productivity Agency (EPA) which is responsible for "seeking, developing and promoting the most suitable and effective methods for increasing productivity . . . . in the member countries."**

**One of the projects of EPA has been the study of automation. At a recent conference in Paris, delegates from member nations gave their views on automation and discussed the latest applications in their respective countries. Political and economic effects were stressed. All major European nations except Spain and Russia were represented. This article is based —in part—on material presented at the conference.**

It is also expected that scientists and engineers will play a more important role in upper management than has previously been the case. Many management decisions will be technical decisions and a wrong decision may have disastrous economic effects for a company because of the heavy investment in automation. In the German view, technical experts should even sit on the board of directors of companies with automated lines.

Cooperation between various members of management is stressed. Engineers and scientists should be capable of understanding economic problems and, conversely, members of management should be capable of understanding technical problems.

One aspect of cooperation is closer integration between product design and manufacturing staffs. To simplify manufacturing and reduce costs to a minimum, products must be designed with automation in mind.

**Size of Plant:** Generally speaking, automation has been confined to large plants; however, there is a feeling in Europe that automation will spread to smaller plants. A special field for small automated plants is in acting as a supplier for larger plants.

The Germans mention the possibility that one of the effects of automation will be greater specialization in industry. There will be an increasing amount of industry-wide standardization of various components going into end products by large manufacturers. The quantities of standard components used by any one manufacturer may not be sufficient to justify setting up an automated line for their production. A small supplier of components, however, may have sufficient orders from several manufacturers to make automation economically feasible. Thus it appears that small-plant automation is a definite possibility.

### Future Trends

One of the factors which has increased the trend toward automation in the United States has been rising wage rates, which are reflected in higher material costs as well as in plant direct labor costs. In order to keep selling prices competitive, many American manufacturers have automated their production lines. European manufacturers have had the same cost problems; complicated in some countries by labor shortages. Although wage rates are comparatively low by American standards, competition is intense.

This competition is not so much between companies as between countries. Most European countries are dependent on the export market for economic stability. Automation offers one means of meeting cost competition in this market. Hence, it can be expected that the number of applications of automation in Europe will increase greatly over the next few years.

European engineers have already demonstrated their competence in the design of automatic production machines. They are following American—and Russian—developments closely and European progress in automation should parallel our own.

# Gadgets

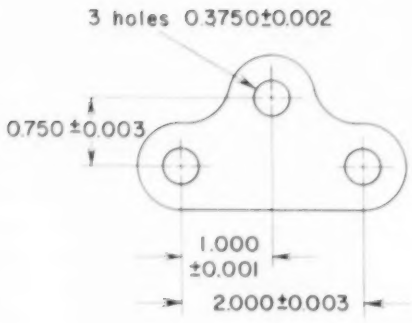
Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

## Gaging Hole Tolerances

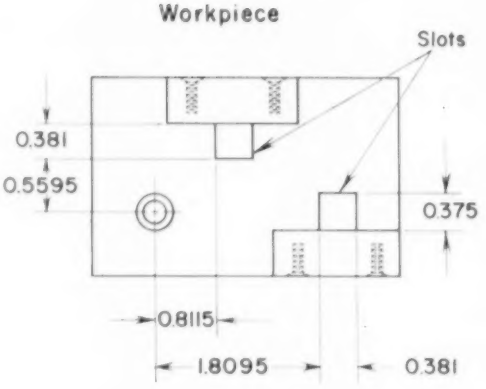
When machined parts are produced on a repetitive basis, it is essential to develop fast, efficient gaging methods. Distances between the holes in the part shown in the illustration could be checked with a micrometer; however, such checking requires considerable time and calculation. Accordingly, the gage shown was developed. This gage gives accurate results, enables parts to be checked quickly and requires minimum skill on the part of an operator.

To use the gage, all three holes are first checked for size with a standard plug gage. One hole in the part is then fitted over the stud in the gage. A plug is used in checking the location of the other two holes. If the plug passes through the workpiece into the appropriate slot in the base of the gage, the hole being checked is correctly located. This type of gage has proved its worth in production and the same principle can be applied for gaging many similar types of parts.

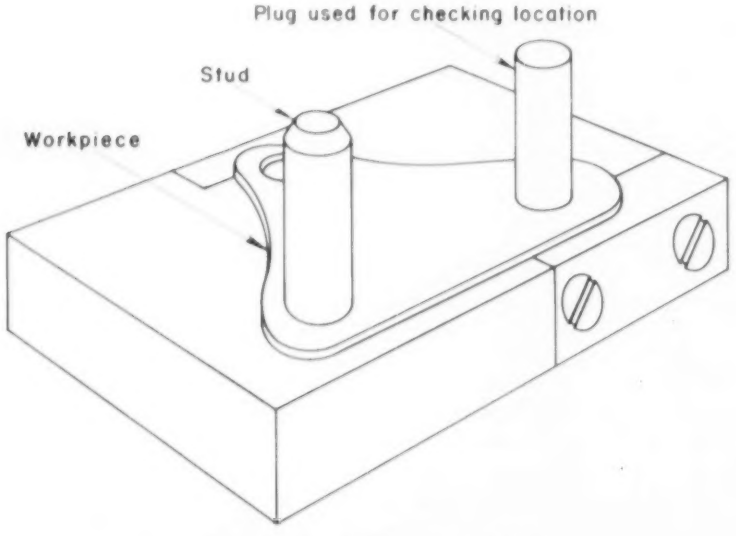
*Donald E. Sweet*
*Marblehead, Mass.*




Workpiece




Plan view of gage



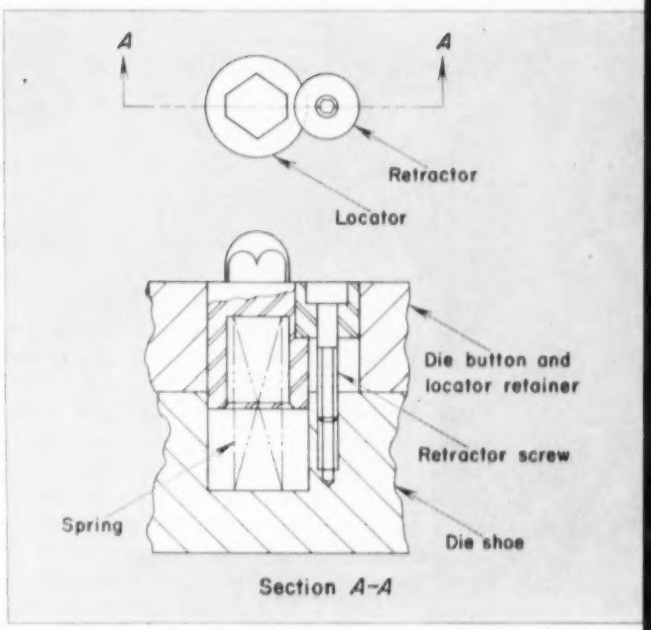

Part being checked on gage

## Retractable Locator for Stamping Dies

Many piercing dies are designed to accommodate different parts which have identical hole patterns. When the parts have different contours, removable locators are used. With these it is necessary to remove and replace locators every time a change-over from one part to another is made. Changing the locators is time-consuming and, unless proper storage facilities are available, locators frequently are mislaid.

Change-overs can be expedited by using retractable locators of the type shown in the drawing. A spring holds the locator in place when it is in use. When not in use, these locators can be retracted by turning the retractor screw a sufficient number of revolutions to draw the top of the locator below the surface of the die. An added advantage of the retaining method is that the locating lands are held in the correct angular position at all times.

*Cliff Bossman*
*Dayton, Ohio*




## Sintered Inserts For Plastic Molds*

Removal of large sheets of rubber or plastic from molds after curing has always been a problem. There is a vacuum between the sheets and the mold and as many as twelve sheets must be removed at one time. The usual method of removing the sheets is to blow them out of the mold individually with compressed air. This is a time-consuming process.

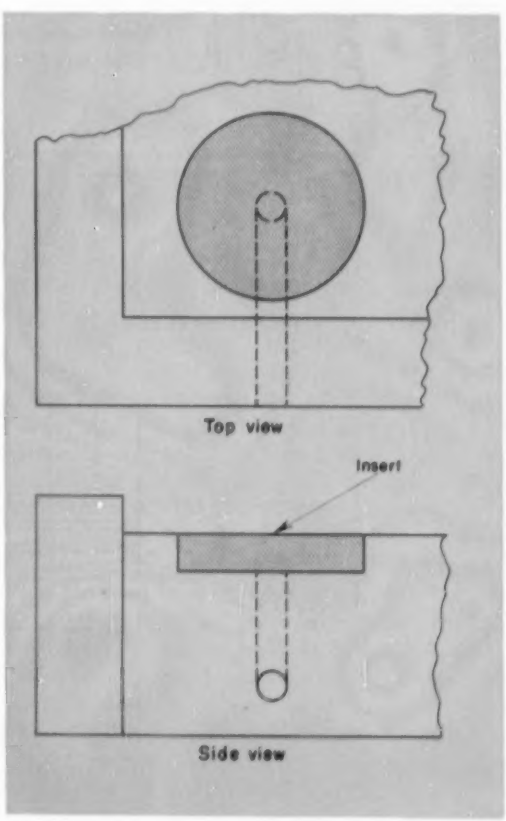
Efforts to remove sheets from the mold by suction were unsatisfactory, since the vacuum under the sheets exerted as strong a "pull" as the suction of the vacuum lifting device.

The problem was solved by placing sintered powder metal inserts in the corners of the mold. There is a small hole under each of these inserts to admit air under the molded sheets. Accordingly, the sheets can be readily removed by vacuum.

Either bronze or stainless steel inserts are satisfactory. They leave no marks on the product if they are properly installed.

*Norbert A. Heyer*
*Member-at-Large*
*Winchester, Va.*

*Gadgets Contest Entry.



## Toolmaker's Locating Jig

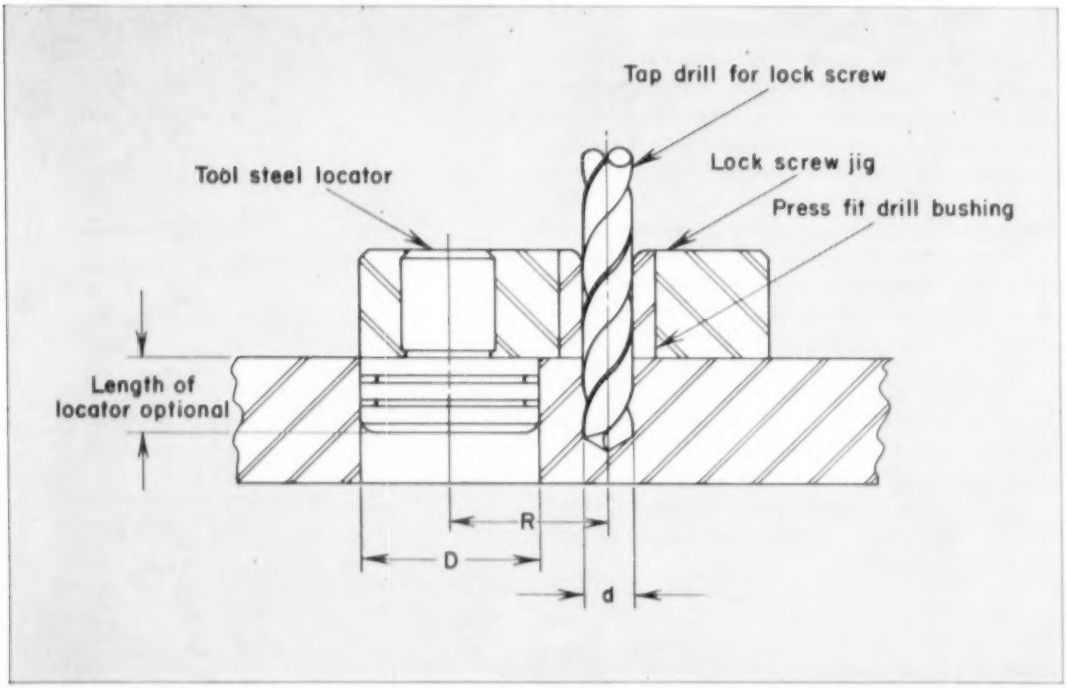
Many toolmakers use slow, precision methods for locating lock screws which secure slip drill bushings. Some will even take the time to use a jig borer to lay out and drill these holes. The radius from the center of the slip bushing hole to the center of the lock screw hole is not extremely critical, however, and it is possible to use a simple jig for locating and drilling the hole.

The jig illustrated is made from cold-rolled steel, cut to suitable size. One hole in the jig accommodates a standard press-fit drill bushing for use in drilling the lock screw hole. A second hole accommodates a hardened and ground tool steel locator plug which fits freely in the bushing hole of the workpiece. To use the jig, the plug is inserted and the jig is turned so that the bushing for drilling the lock screw hole is in the desired position. A set of seven jigs will handle all standard sizes, making it possible to drill lock screw holes on a drill press. Dimensions for the seven jigs are shown on the accompanying chart.

*H. J. Gerber*
*Member-at-Large*
*Stillwater, Okla.*

**Jig Dimensions for Various Tap Sizes**

| Jig Number | Critical Dimensions | Tap Size |
|---|---|---|
| 1 | D = 0.499 (+0.000, —0.001)<br>R = 0.500 (+0.004, —0.000)<br>d = "F" drill | 5/16 - 18 NC |
| 2 | D = 0.749 (+0.000, —0.001)<br>R = 0.625 (+0.004, —0.000)<br>d = "F" drill | 5/16 - 18 NC |
| 3 | D = 0.999 (+0.000, —0.001)<br>R = 0.750 (+0.004, —0.000)<br>d = "F" drill | 5/16 - 18 NC |
| 4 | D = 1.374 (+0.000, —0.002)<br>R = 0.922 (+0.005, —0.000)<br>d = "F" drill | 5/16 - 18 NC |
| 5 | D = 1.749 (+0.000, —0.002)<br>R = 1.109 (+0.006, —0.000)<br>d = "F" drill | 5/16 - 18 NC |
| 6 | D = 2.249 (+0.000, —0.002)<br>R = 1.390 (+0.006, —0.000)<br>d = 5/16 drill | 3/8 - 16 NC |
| 7 | D = 2.749 (+0.000, —0.002)<br>R = 1.640 (+0.008, —0.000)<br>d = 5/16 drill | 3/8 - 16 NC |



# Realistic Depreciation Policies Are Vital to Survival

**By A. N. Cole**
**Manager Tax and Insurance Dept.**
**Chrysler Corp.**
**Detroit, Mich.**

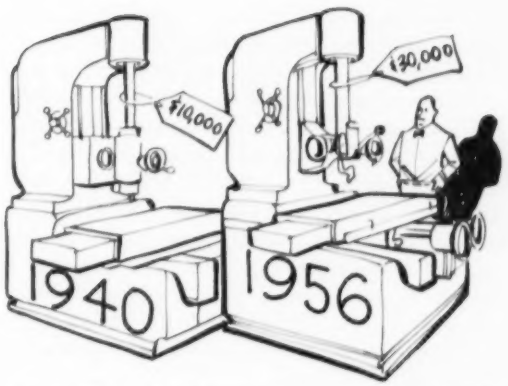



**Fig. 1. The tool engineer must cope with continually rising costs in replacing worn-out machines.**

**How can the Tool Engineer get approval for new equipment that is badly needed? Some of the basic approaches are apparent from this authoritative discussion, which appraises effects of inflation, competition and method of depreciation.**

TOOL ENGINEERS attempting to replace worn-out machinery must continually cope with inflation in the cost of plant and equipment. Seriousness of this problem is indicated by the fact that today costs of equipment in some industries are three times what they were in 1940, *Fig* 1. In the automotive industry the pace of increases in replacement costs is indicated by the sample estimates shown in TABLE 1.

At present a barrier faces all owners of mechanical equipment who must reckon with expiration of the usefulness of that equipment and provide for its replacement. Tool engineers concerned with their future should examine the nature of this barrier and seek to determine what can be done about it. This barrier is the conventional accounting and tax practice of measuring equipment depreciation in terms of original rather than replacement cost. While this may seem to be a matter of bookkeeping, accurate expense and income determination is essential for a firm because it can spell the difference between business health and failure. Artificial or unwarranted diversion of sales dollars into net income may result in excessive dissipation of such dollars into dividends. This can deprive the manufacturer of sufficient funds for operation.

The problem, then, is one of properly determining the company's net income before Federal income taxes. Reduced to simplest terms the basic method is to deduct from the gross sales figure the expenses incurred and the result will give net income. Soundness of the net income figure is dependent therefore upon the accuracy of the expenses. Expenses for this purpose, then, denotes cost of goods sold. In a manufacturing business this includes among other things the cost of materials used in the product, or inventory, and the cost of expira-

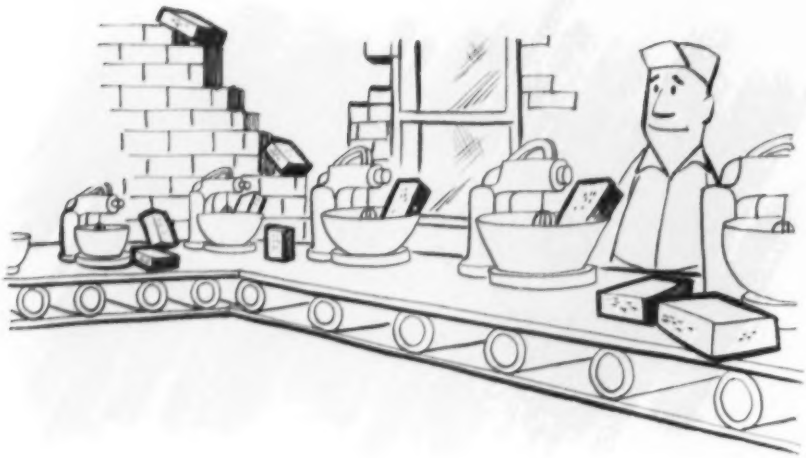


**Fig. 2. A manufacturer sells bits of his plant and equipment with his product.**

tion of plant and equipment, or depreciation.

In the Annual Report of the Chrysler Corp. for 1947, President Keller devoted considerable space to the problem of high cost of replacement. He noted that the original cost of equipment in use by the Corporation aggregated $210,384,000. At current prices this equipment would have cost $352,000,000 to replace. Depreciation reserves accumulated at that time amounted to $130,514,000.

Since a company that wants to continue in business must provide for replacing worn-out equipment, he announced then that Chrysler had decided to modify its depreciation policy by accelerating charges for early years of productive facilities acquired since the war. United States Steel in 1947 also adopted a method of accelerated depreciation or cost, as a means of approaching recording the wear and exhaustion of facilities in terms of current dollars as distinguished from dollars originally expended for those facilities.

**Table 1—Comparison of Costs of Typical Machines Showing Increases Due to Inflation and to Improvement**

| | COST | | INCREASE | |
|---|---|---|---|---|
| | 1946 | 1956 | Due to Inflation | Due to Improvement |
| OBI press, 75-ton | $ 4,500 | $ 9,000 | $3,000 | $1,500 |
| OBI press, 110-ton | 6,000 | 12,000 | 4,000 | 2,000 |
| Vertical mill, #4 | 19,050 | 29,700 | 7,100 | 3,550 |
| Horizontal mill, #4 | 18,700 | 25,900 | 4,800 | 2,400 |
| Lathe, 16-in. | 8,000 | 12,000 | 2,700 | 1,300 |
| Drill press, 24-in. | 3,850 | 5,400 | 1,030 | 520 |
| Surface grinder, 36 x 60-in. | 32,000 | 40,000 | 5,300 | 2,700 |
| Surface grinder, 6 x 18-in. | 1,890 | 4,320 | 1,620 | 810 |
| Shaper, 24-in. | 4,900 | 11,000 | 4,070 | 2,030 |
| Radial drill, 6-ft. | 15,500 | 23,300 | 5,200 | 2,600 |

**Table 2—Comparison of First-in-First-Out Inventory Valuation with Last-in-First-Out**

| | Fifo | Lifo |
|---|---|---|
| Sales | $1,000,000 | $1,000,000 |
| Inventory expense | 800,000 | 960,000 |
| Net income | $ 200,000 | $ 40,000 |

A method has been developed to accurately value inventory in terms of current, or cheap, dollars instead of using historical, or expensive, dollars. Historical dollars represent the expense when the inventory was purchased.

The method is known as last-in-first-out, or Lifo. In contrast to the first-in-first-out (Fifo) method, Lifo better reflects inventory costs that have entered into this year's sales. An extreme example will show the difference between these methods. Suppose that 8000 pieces of inventory were bought this year at a cost of $120 apiece; that 8000 pieces of inventory bought last year cost $100 apiece, and that 8000 pieces were used in products sold. Therefore, there still is a year's purchases on hand. Considering only inventory to constitute expense, the two methods would operate as shown in TABLE 2.

The 20 percent difference in cost of inventory used produces an 80 percent drop in income. Although an extreme example, this emphasizes the element of fiction in the Fifo method, that regards all dollars of expense, no matter when incurred, as if they were equivalent in purchasing power to this year's sales dollars. While in actual practice the difference is much less obvious, it is nevertheless real. The choice between these methods of measuring outgoing expenses is not related to whether the actual products manufactured are made up of the inventory bought either earlier or later. Rather it is related to the acknowledgment of replacement costs.

More and more manufacturers every year are turning to the Lifo method of measuring inventory expenditures. No doubt they are doing so because they believe this is the accurate way to determine net income. Because of the annual inflation factor it is easy for a company to be misled and to mislead

**Table 3—Comparison of Current Methods of Determining Depreciation**

| | Straight-line | Declining-balance | Sum-of-Digits |
|---|---|---|---|
| 1st year's depreciation | $100,000 | $200,000 | $166,667 |
| 2nd year's depreciation | 100,000 | 120,000 | 133,333 |
| 3rd year's depreciation | 100,000 | 72,000 | 100,000 |
| 4th year's depreciation | 100,000 | 43,000 | 66,667 |
| 5th year's depreciation | 100,000 | 25,920 | 33,333 |
| Total (equals original cost) | $500,000 | $461,120* | $500,000 |

*This formula never fully amortizes the cost, but "tails out" perpetually.

shareholders as to the true size of the year's profits. By paying dividends on the basis of Fifo inventory, the result may be an embarrassing shortage of funds needed to continue operations.

The depreciation factor in the net income figure can be compared in many respects to inventory. From the accounting viewpoint, depreciation is simply a word to denote converting plant and equipment into sales. In the economic sense the manufacturer each year in each of his individual product units sells bits of his plant somewhat as he sells pieces of inventory, *Fig.* 2. Depreciation methods measure rate and amount of this expense just as the inventory method does for inventories.

Accountants in recent years have used a variety of depreciation methods. The most common methods today are the straight line, declining balance and sum-of-the-years' digits. All three are essentially Fifo in nature, because they apportion original cost over the life of the plant or equipment. A comparison of these methods, applied to a 5-year asset costing $500,000, shows none of them deals with other than the original or historical cost, TABLE 3.

While the Lifo method has been widely accepted for application to inventories, similar principles have not been recognized as applicable to plant and equipment. The manufacturer must pay as he goes for replacement plant and equipment. Unless he does so he is in the fix that a wage earner would be in if he claimed too many exemptions on his withholding certificate. The wage-earner's take-home pay would be greater during the year but it would be spent and he would have a tax deficit on April 15 and no money with which to pay.

The manufacturer, if he can find no funds for replacement purposes, must go out of business in the course of a short time because of lack of competitive efficiency, *Fig.* 3. With the lion's share of net income of a company usually paid out as dividends, depreciation reserves usually are regarded as the prime source of plant and equipment replacement funds, even though this is neither a financial nor legal requirement. This handling is exemplified in the chart from the 1953 Annual Report of General Electric, *Fig.* 4.

Only replacement has been mentioned thus far, whereas the manufacturer must not only see to this but must also provide funds for expansion as well. Most corporations today are faced with the need for capital funds to expand facilities to meet increasing consumer demands for their products.

An important part of this picture is that depreciation charges must furnish at least a major part of such replacement and expansion funds in the face of inflation. In the inventory area Lifo has emerged as the realistic answer to inflation. What answer is available in the equipment depreciation area? The most frequently mentioned solution is "replacement-cost depreciation." Depreciation charges are computed on the basis of what would have to be paid if the equipment were bought new today.

To compare these two methods, assume a 12-year life machine tool that cost $100,000 when new in 1946 and would cost $160,000 to replace today. The




**Fig. 3. Failure to provide adequate funds for working capital or equipment replacement can be disastrous.**

depreciation charge, on a straight-line basis of 8⅓ percent of cost per year, would vary from $8,333 for the original-cost method to $13,333 under the replacement-cost method.

Related to the replacement-cost method, "index number" depreciation establishes the value of current dollars and the value of the dollar at the time of purchase. By this method and assuming a current price index of 168, the depreciation charge for the machine tool of the previous example would be $13,999.

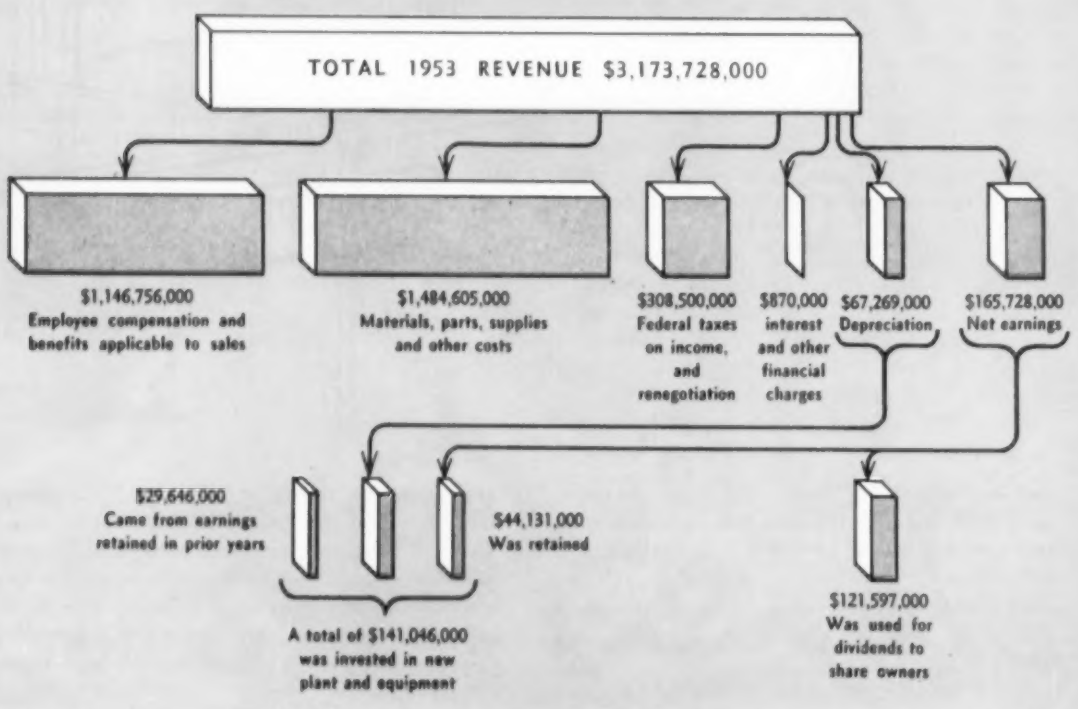
A possible third approach is to make appraisal write-ups of existing equipment and compute the depreciation charge on the increased value. Thus if the machine in the preceding example had a book value at the end of 1955 of $16,667, but an appraisal showed its present market value to be $25,000, the depreciation charge would then be $12,500. This is 50 percent of $25,000, since the remaining life is two years.

None of these accelerated methods of approaching the depreciation problem has found favor in the eyes of the entire accounting profession. Meanwhile the problem has intensified. Cost indexes have risen 70 percent additionally in the 10 years since 1947. There is rising pressure on accountants to develop and establish a depreciation practice more satisfactory than the "accelerated" methods. What is the delay? This reluctance of the profession may stem from a feeling that replacement cost is a fiction, because it uses suppositous costs in income determination. There also is a feeling this would be a Pandora's-box departure from the basic historical cost method, *Fig. 5*.

A way over this dilemma must be found. The concept of an equipment Lifo would be a step toward solution. The principle of the inventory Lifo has moved from the area of debate into wide commercial and industrial acceptance. As noted, inventory accounting does not concern itself primarily with physical identification of inventory units, but rather with the flow of costs into inventory and out of inventory into sales. This concept says that continuing inventory is necessary to run a business and that by maintaining it at the present price level current inventory costs are matched against current sales dollars. Income determination is more realistic.

In many respects there is a substantial likeness between equipment and inventory. Since heavy equipment has a longer life than inventory, it usually is more positively identified. Identification is primarily for accountability or custodial purposes. Light or perishable tools, on the contrary, are expensed in industrial practice as soon as they reach the receiving dock. The account regards them as

**Fig. 4. Money for plant and equipment comes out of depreciation accounts, as graphically shown by this chart from the GE 1953 Annual Report.**



being even more immediately consumed and expended than inventory. Major equipment also undergoes consumption, its consumption differing from that of the light tool only in rate or pace.

As in the case of inventory it would be reasonable to regard a manufacturer as having to maintain a base stock or fixed complement of equipment, as indeed he must regardless of accounting principles, laws or taxes, if he is to stay in business. Why not relate equipment replacement funds to current selling prices?

It is more logical and necessary than in the case of inventory, to recognize that the manufacturer maintains a base dollar quantity of equipment. He keeps his equipment longer. In view of the slower consumption of equipment a Fifo treatment of equipment renders the manufacturer more vulnerable to inflation. It causes him to retain out of income over the life of the equipment possibly only 50 percent as many dollars for replacement purposes as he will require. In the case of inventory the percentage might be 93, or the dollar shortage only 7 percent. There seems to be no valid reason why equipment items may not be regarded as interchangeable to the same extent as inventory for the purpose of computing depreciation expense. Presumably in an industry with a reasonably active replacement program this equipment Lifo practice would produce depreciation charges approximating those under the index-number system. If so, this would be a good proof of its soundness. This might be an evolutionary step to an eventual full-scale recognition of the index-number method.

There are mathematical and practical computing problems involved, as well as certain balance sheet or valuation matters. Determined ingenuity, however, would soon solve these problems.

In addition to business reasons for favoring a Lifo depreciation method there are those that apply to taxes. Taxes cut down income and therefore cut down the primary source of funds that a business requires to keep going. The Federal income tax takes more than half of the sales dollar that remains after deducting expenses. Thus, to add the tax factor to initial example of income determination produces the following result:

| | |
|---|---|
| Sales | $1,000,000 |
| Expenses | 800,000 |
| Net income before tax | $ 200,000 |
| Federal income tax (52%) | 104,000 |
| Net income | $ 96,000 |

Assuming that the seas of inflation are to run continually higher, it is desirable to give further consideration to inventory Lifo, for reasons evident from TABLE 4.

This shows how Lifo inventory policies make it possible for a company to keep its head above the waters of financial planning. With such a realistic treatment dividend expectations of shareholders should be moderate. Greater working capital resources are retained in the business and greater maneuverability is maintained in the unending contention with competition. Pricing of the product ought to be less of an annual guessing game. Assuming an expanding economy, a company annually saves an increasing amount of funds needed for productive use in the business, which otherwise would go for taxes. This minimizes the possibility of management being misled or misleading shareholders as to the economic result of annual operations.

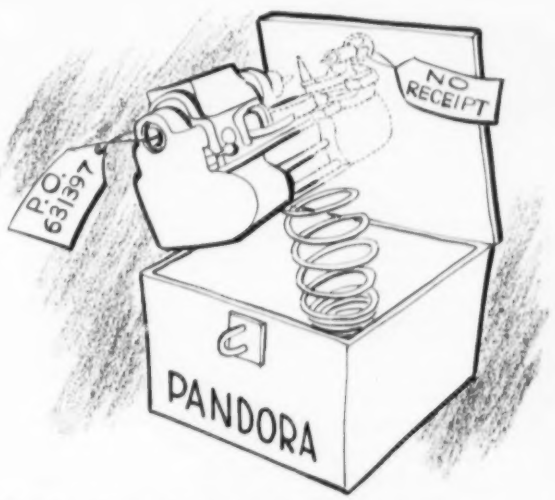



**Fig. 5. Accountants find it difficult to charge costs against anything but a receipted item. They cannot account for inflation as a suppositious cost.**

How do these tax considerations regarding inventory apply to depreciation of equipment? There seems to be little doubt that they apply even more strongly. Companies that have not adopted Lifo for inventory have sought by such means as accelerated depreciation, to make their income statements take adequate account of current equipment costs. This is not a satisfactory solution because it confines itself to historical cost. There is increasing pressure for a true Lifo form of practice.

The reason is that the manufacturer's equipment turns over more slowly. He sells his inventory increments in about one year. He sells his equipment increments through wear, exhaustion and obsolescence in the creation of products, only over periods of say five to twenty years.

The failure thus far to reach a real remedy occasions increased concern at the dangerous siphoning off in taxes of evanescent "income" dollars, which in economic reality ought to be retained as depreciation reserve. Suppose the case of a manufacturer whose plants and equipment average 10 years in life. His annual sales are $1,000,000 and

**Table 4—Comparison of Cash Position after Taxes Shown by Fifo and Lifo Inventory Methods**

| | Income and Expense | |
|---|---|---|
| | Fifo Method | Lifo Method |
| Sales | $1,000,000 | $1,000,000 |
| Inventory expense | 800,000 | 960,000 |
| Net income before tax | $ 200,000 | $ 40,000 |
| Federal income tax* | 104,000 | 20,800 |
| Net income | $ 96,000 | $ 19,200 |
| | Cash Flow | |
| Cash from sales | $1,000,000 | $1,000,000 |
| Inventory purchases | 960,000 | 960,000 |
| | $ 40,000 | $ 40,000 |
| Cash for tax payment | 104,000 | 20,800 |
| Net cash gain (or loss) | $ (64,000) | $ 19,200 |

*Assuming a flat 52 percent rate application

**Table 5—Comparison of Equipment Replacement Funds by Present and Proposed Methods**

| | Income and Expense | |
|---|---|---|
| | Present Fixed Cost Method | Proposed Current Cost Method |
| Sales | | |
| 10 x $1,000,000 | $10,000,000 | $10,000,000 |
| Depreciation expense | 1,000,000 | 1,500,000 |
| | $ 9,000,000 | $ 8,500,000 |
| Other expense | 8,000,000 | 8,000,000 |
| Net income before tax | $ 1,000,000 | $ 500,000 |
| Income tax | 520,000 | 260,000 |
| Net income | $ 480,000 | $ 240,000 |
| | Cash Flow | |
| Depreciation funds | $1,000,000 | $1,500,000 |
| Cash position | 1,480,000 | 1,740,000 |
| Replacement expenditures | 1,500,000 | 1,500,000 |
| Final cash position | $ (20,000) | $ 240,000 |

he paid $1,000,000 for his original equipment. The present original-cost and proposed current-cost methods of depreciation presumably would have roughly the effects on his affairs over ten years as shown in TABLE 5.

Under present tax laws and accounting conventions the fixed cost method with acceleration is the only permissible method of computing and retaining depreciation reserves from income. The law does not permit the machine, so to speak, to provide for its retirement in prudent fashion. What are the possibilities of establishing a true remedy?

The growth of changes in accounting methods, as in other fields, takes time. The time is consumed in incubation, in disseminating the new concept and letting people become accustomed to it so that they no longer avoid it simply because of its newness. This was the case with the Lifo inventory method. It is now not only in wide use but since the late 1930's has been expressly recognized for purposes of Federal income tax computation.

The arrival of an adequate and realistic depreciation method is now due. Its development advanced importantly in 1954 when Congress in the Internal Revenue Code for that year recognized the national interest in progressive industrial practices by enacting acceptance of accelerated methods for Federal income tax purposes. The engineering profession, as well as the accounting profession, has an important role to play in the emergence of a sound current-dollar method of figuring equipment depreciation in the metalworking industries.

# Test System Seeks Minute Cracks



**If there are cracks in the plate surface, they will show up through irregularities in the magnetic field as metal power is spread by a rubber squeeze bottle. Shifting the prods 45 deg. tests for transverse flaws.**

Magnetic particles are used to supplement radiography procedures to detect small surface cracks in finished welds on heavy ship plates at Brooklyn Navy Yard. Such cracks are difficult to discover with X-rays.

Technicians use a Portaflux unit to check a weld for longitudinal defects. Special metal powder spread by means of a rubber squeeze bottle, indicates irregularities in the magnetic field when cracks are present. A second device designed for use with the magnetic particle test, consists of a magnetic cross in a nonmagnetic housing. This tool indicates flux direction and assures the operator that magnetization is sufficient to indicate defects, if present.

The portable Philips Electronics instrument used in the tests takes power from a standard electric system.

In many shop operations, protecting the worker's skin against irritants is a constant problem.

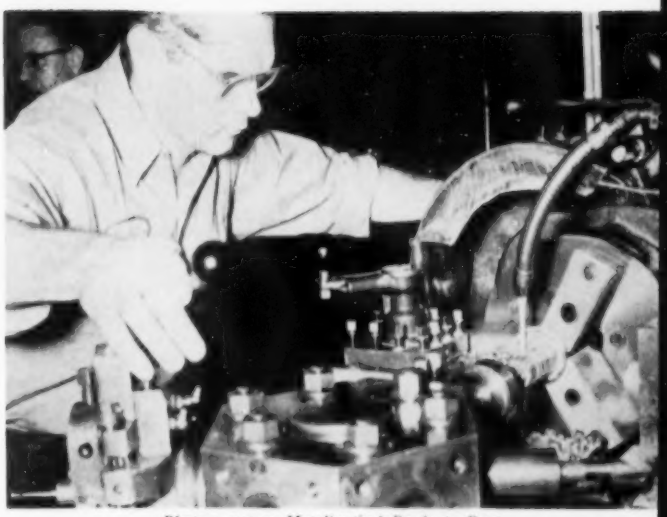


*Photo courtesy Metallurgical Products Dept. General Electric Co.*

# PREVENTING SKIN TROUBLES in the shop

**By W. Schweisheimer, M. D.**
Rye, N. Y.

CONSTANT EXPOSURE to oils and solvents used in the shop can lead to severe skin irritations. These cause pain and discomfort and they are economic liabilities as well. The annual cost of dermatitis to industry has been estimated at $100 million and the average cost of medical care is $90 per case.

Much of this economic loss can be avoided if workers wear protective clothing, such as rubber gloves. Washing the skin thoroughly after exposure to irritants is also effective. If it is not feasible to wear gloves, special creams give adequate protection.

Water-miscible oil-resistant creams protect the skin against dirt, dust and grime, greases and oils, solvents, paints, lacquers and other irritants which do not contain water. Such creams contain modified vanishing type bases and are readily removed with soap and water.

Water-repellent creams are formulated to give protection against dilute acids or alkalies and other water-soluble irritants, and also act as barriers against emulsified oils and solvents or other mixtures containing water. Creams in this group are based on fats and waxes or silicone compounds.

A third group of creams protects the skin against solvents. In these preparations, mixtures of glycerine and gelatine with water, glycerine and cellulose ether with water, or glycerine and solium polyacrylate with water, form a solvent-resistant film on the skin.

Washing the skin after exposure to irritants, using a special cleanser, is an important factor in eliminating skin troubles. A satisfactory cleanser should consist of a superfatted neutral toilet soap containing a wetting agent or synthetic detergent, and a "scrubber" which softens or dissolves in water. Cleansers containing large amounts of free alkali or silica, quartz or pumice or feldspar scrubbers should be avoided, since these substances may scratch the skin. To remove tenacious oils or greases, corn meal or other scrubbers made from soft cereal can be added. Lathering is not necessary; however, operators often prefer cleansers with lathering properties. Coconut-oil soaps lather well.

When strong cleansers are used, the operator should be supplied with an emollient cream to be rubbed into the hands after cleansing. This will replace fats removed by the cleanser.

Waterless hand cleansers are increasingly popular with machinists because they appear to clean the skin efficiently without the need of water washing or rinsing. Cleansers containing kerosene, benzene, tuolene, trichlorethylene or other volatile hydrocarbons may cause skin troubles.

Many machine operators are unaware of the hazards involved in coming into contact with materials which may irritate the skin. If operators are provided with protective gloves or creams and suitable hand cleansers, lost time due to industrial dermatitis can be reduced to a minimum.

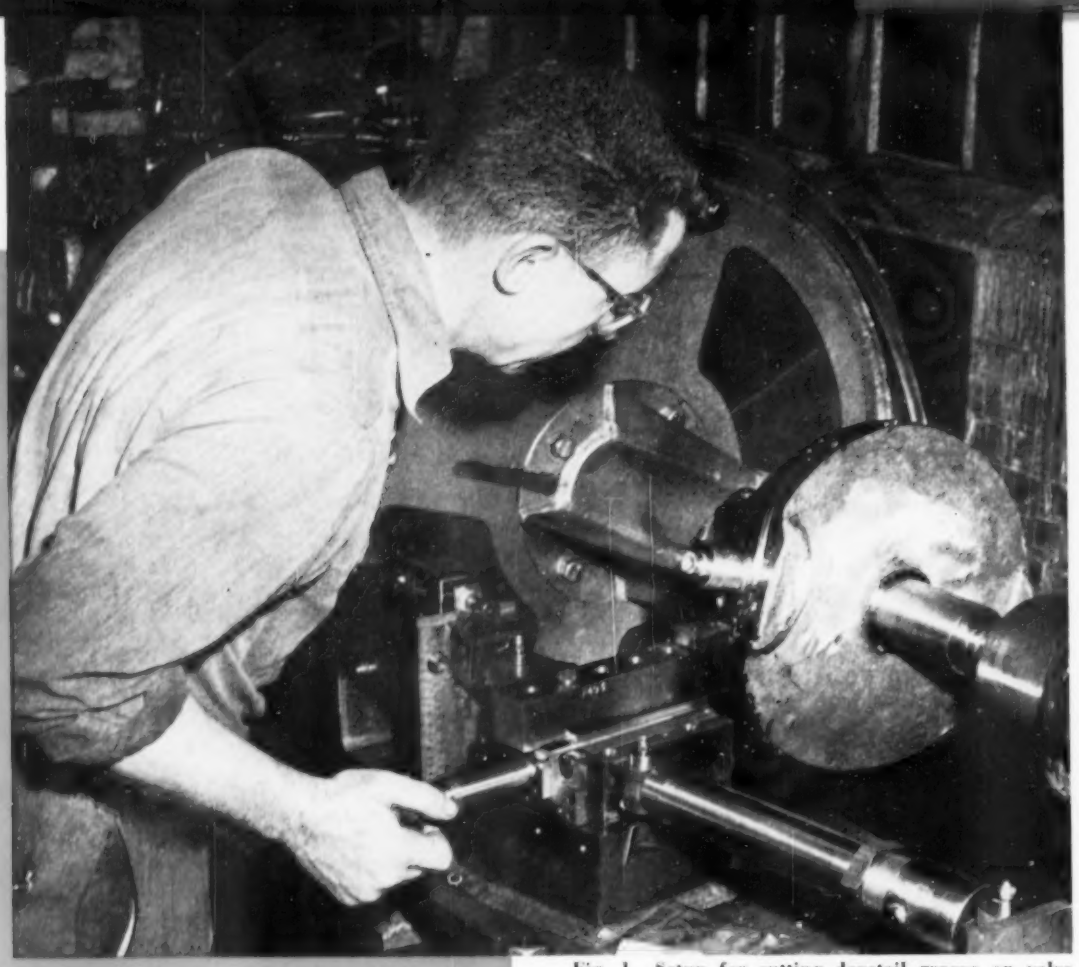


Fig. 1. Setup for cutting dovetail groove on valve disk, using circular dovetail block and spring cylinder.

# flexible thinking

## *creates critical tooling*

**By G. H. Kendall, Jr.**
**Assistant to Shop Mgr.**
**Electric Boat Div.**
**General Dynamics Corp.**
**Groton, Conn.**

**Tooling up to make parts for atomic subs posed many challenges to tool engineers and production managers. How some of these challenges were met should prove interesting reading to engineers in the manufacturing field.**

SUCCESSFUL PRODUCTION of military components today often requires new tooling techniques and processes as well as the revision of old ones. In the production of parts for nuclear submarines ingenious adaptation is needed. Ordinary tooling methods are unable to cope with the unusual problems that must be overcome.

A case of this type involves machining of an intricate butterfly valve, *Fig.* 1, which is the guardian protecting watertight compartments of the atomic submarine from sea pressure. Production personnel of the Electric Boat Div. of General

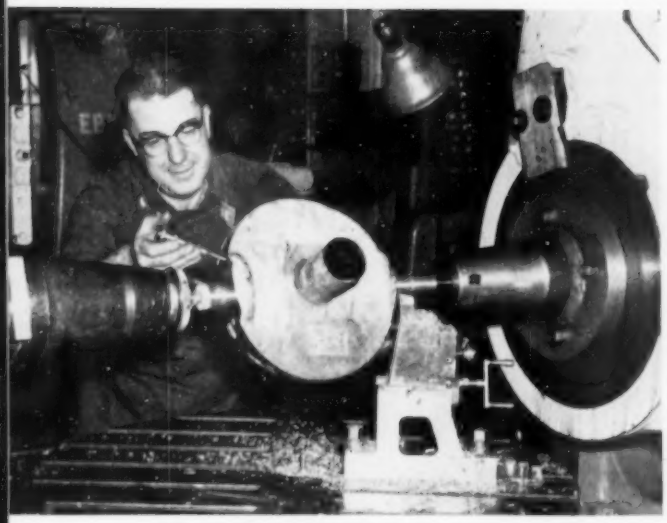


**Fig. 2. Spherical surface on the valve disk is generated in a horizontal boring mill with the workpiece being rotated instead of the tool, as is usual.**

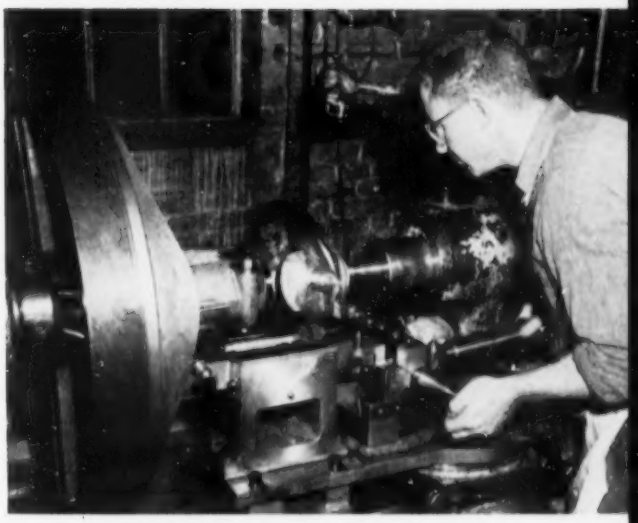


**Fig. 3. Cam and follower mechanism guides cutting tool in cutting the dovetail groove, in the setup shown in *Fig.* 1, of bulkhead ventilation valve disk.**

Dynamics Corp. gave new twists to existing principles and solved a production bottleneck by converting standard machinery for the fabrication of this important valve.

When tool engineers and production managers were asked to devise procedures to produce this radically different bulkhead ventilation valve, they discovered that previous tooling could not do the job. The valve is designed to control ventilation between the many watertight compartments of a submarine and also to provide a leakproof seal that will withstand sea pressure if any compartment is flooded. Three basic tooling problems had to be solved: (1) machining in spherical surface on a valve disk, (2) cuting a dovetail gasket groove on the spherical surface and swinging a dovetail groove in an arc around the trunnion of the disk, and (3) boring a spherical seat in the middle of the cylinder housing.

Without resorting to specialized tooling the four-man team analyzed their own machine tool resources and devised new procedures which utilized existing machinery so effectively that their methods are now standardized throughout the shop. The solutions worked so well that the size of the valve is the least difficult factor in its production.

A step-by-step breakdown of their methods shows a flexibility of thought that is essential for small-lot tooling and production. For machining a spherical surface on the valve disk a horizontal boring mill was selected, *Fig.* 2. The team reversed standard boring mill practice by rotating the work instead of the tool. The disk was mounted on the boring mill with one trunnion in the steady arm and the other trunnion attached to the spindle for driving and support purposes. The cutting tool was mounted on a power-driven rotary table and attached to the machine. Hand adjustment of the cutting tool was provided to regulate the depth of cut and to control the diameter. The tool feed was adjusted by varying the speed of the power-driven rotating-blade table.

Two problems had to be resolved to cut the dovetail groove on the spherical surface. One question was how to traverse the tool in order to swing it around the trunnion and back on the center line of the disk. A second was how to preserve the depth of the groove so as to stay normal to the surface of the disk. These were solved by mounting the disk on centers in a standard engine lathe, *Fig.* 3. The cutting tool is mounted so that it can be moved on a radius in a horizontal plane about the center of the valve disk. The toolholder travels in a curved dovetail in a block secured to the carriage of the lathe.

The lateral movement of the tool and holder is actuated by a cam secured to the lathe faceplate. A connecting link sliding in gibs carries the cam follower and is pinned to the tool and holder. The cam follower is held against the cam by means of a telescoping spring cylinder mounted on the tailstock side of the carriage and pinned to the toolholder. This procedure cuts a plain groove and then undercuts each side to form the dovetail. A lateral adjustment of the tool can be made for dovetailing.

Designing the tooling in this manner has enabled the shop to machine any disk of similar design from 6 to 18 inches in diameter with the same tooling. Tool setting gages were made to facilitate setup.

Boring the spherical seat in the center of the cylinder housing is done on a standard 74-inch vertical turret lathe. The body is mounted on an

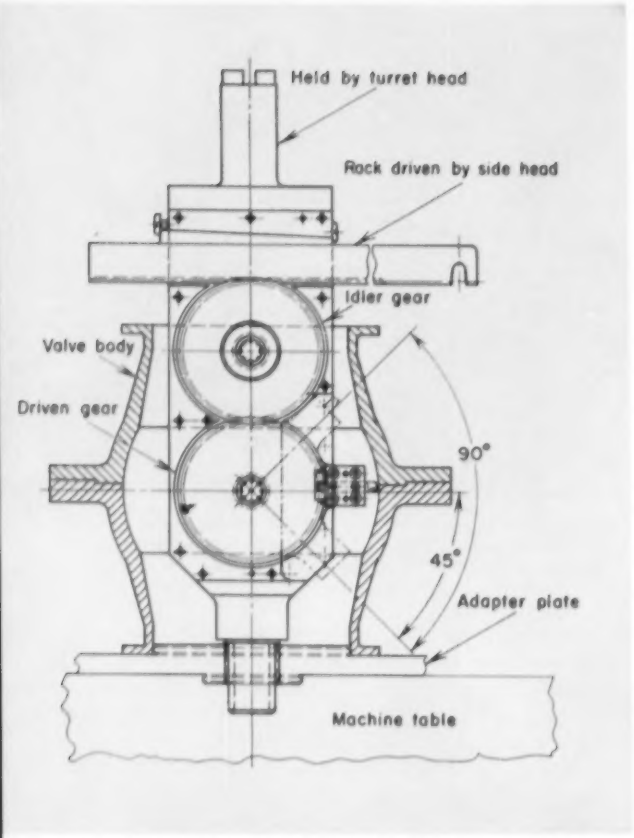



**Fig. 4. Tool for boring spherical seat in valve body. A vertical turret lathe is used for the operation.**

adapter plate for locating purposes. This plate is bored to form the lower bearing for a spherical boring tool, *Fig.* 4. Upper bearing is provided by fastening to the vertical head of the machine.

The principle of the operation of the tool is to translate linear motion from the side head of the machine into rotary motion of the cutting tool about a point. This was accomplished by pushing a rack with the infeed of the side head. The rack drives an idler and a driven gear, which is keyed to a shaft. The cutting tool is secured to and pivots about this driven shaft to cut an internal spherical bore. Tool setting is facilitated by rotating the tool to a vertically up or down position and adjusting to a gage for proper diameter. The valves, now in standard production, have been produced in many sizes without involving assembly troubles.

A machine shop constantly beset with production problems brought on by the stream of unusual and varied product designs needed for atomic submarines must be supported by personnel with open and inventive minds.

Tooling that this team devised for the bulkhead ventilation valve is one example of many such instances in which sound thinking and new ways of looking at old methods have produced astonishing results These can be ascribed to the informal team approach used and to the creativity of the members as well as to their cooperative effort. Both the approach and their methods, although devised for this specific job, may be found widely applicable to manufacturing problems.

## Data Processing Stepped Up

Time required to process test and engineering data will be reduced from a matter of days or weeks to only a few minutes by the electronic calculator that will be produced by Minneapolis-Honeywell Regulator Co.'s Industrial Div. It will be able to handle 128 separate pieces of information at one time when measuring such conditions as temperatures, pressures and strains.

To make its calculations, information is absorbed as electrical signals, which the processing system converts accurately into numbers and records on magnetic tape at speeds at 10,000 per second and faster. Through an electronic playback, the recordings or readings are translated into the language necessary for further automatic processing in an electronic computer.

According to Henry F. Dever, vice president of the Iudustrial Div., as many as 4,800,000 separate readings can be processed in less than 15 minutes.

At present the system is directed toward aeronautics; however, engineers expect that it ultimately will find application in atomic energy and in industry where there is an increasing need for handling data at top speed. As compared to the one to five samples per second handled by industrial process recording equipment currently in use, the Instrumentation Digital On-Line Transcriber, or IDIOT II), can process 10,000 samples per second.

The system, designed by Dr. Martin L. Klein, head of the Advanced Instrumentation Development Unit of Rocketdyne division of North American Aviation Inc., fits into two five-foot consoles.



*"I fed it an old piano roll."*

# Pull Reaming
## prevents runout problems



**By William G. McEwan**

Project Leader
Manufacturing Methods Unit
Watervliet Arsenal
Watervliet, New York

**Pull reaming offers several advantages over push reaming in the production of large tubes. These advantages are discussed by the author, who also describes the tooling and equipment used in this new and interesting process.**

PUSH REAMING is the conventional method of producing straight bores in long cylindrical tubes. Although this method is extensively used in manufacturing gun barrels or tubes for cannon, controlling runout and concentricity is difficult.

**Controlling Runout:** Runout or concentricity problems are inherent in the push reaming process. As a reaming tool is pushed through a bore, *Fig.* 1, the load on the cutters may in itself be sufficient to cause deflection. Axial compressive forces may bend the boring bar, thus deflecting the tool. Uneven distribution of stock in the bore or variations in the hardness of the tube material can also cause deflection.

Many attempts have been made to control bore runout by modifying the design of reaming tools. The packs which provide bearing contact between the bore and the reamer body have received special attention because of the possible relationship be-

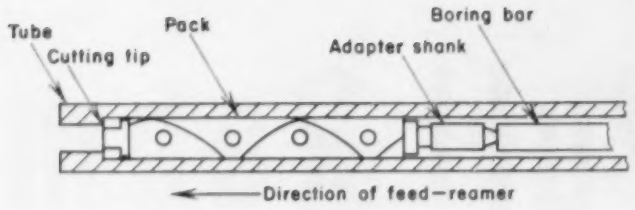



**Fig. 1. Conventional push reaming. Tube is rotated around non-rotating reamer.**

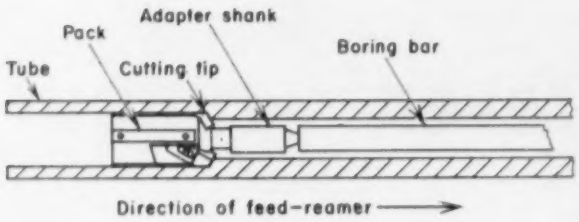
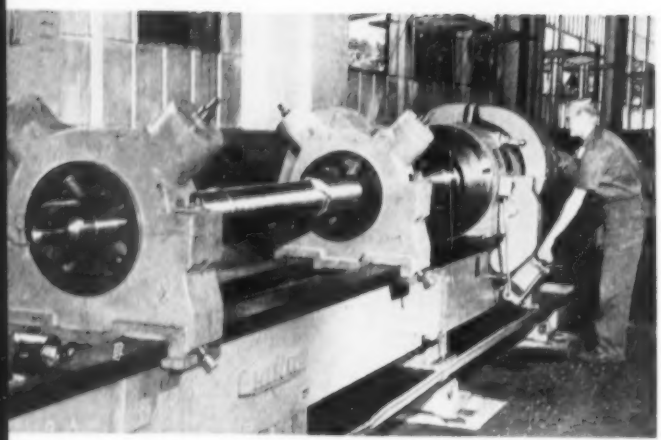



**Fig. 2. Pull reaming. As in push reaming, tube rotates around reamer.**



*U. S. Army photograph.*

**Fig. 3. Setup for experimental pull reaming. Tube is chucked in hollow-spindle lathe and is supported by roller type steady rests.**

tween pack wear and runout. At Watervliet Arsenal, numerous pack materials such as Teflon, Micarta, elk hide, rubber-impregnated leather, carbide, brass, teak and plastic-impregnated wood, were exhaustively tested. None of these alleviated runout problems.

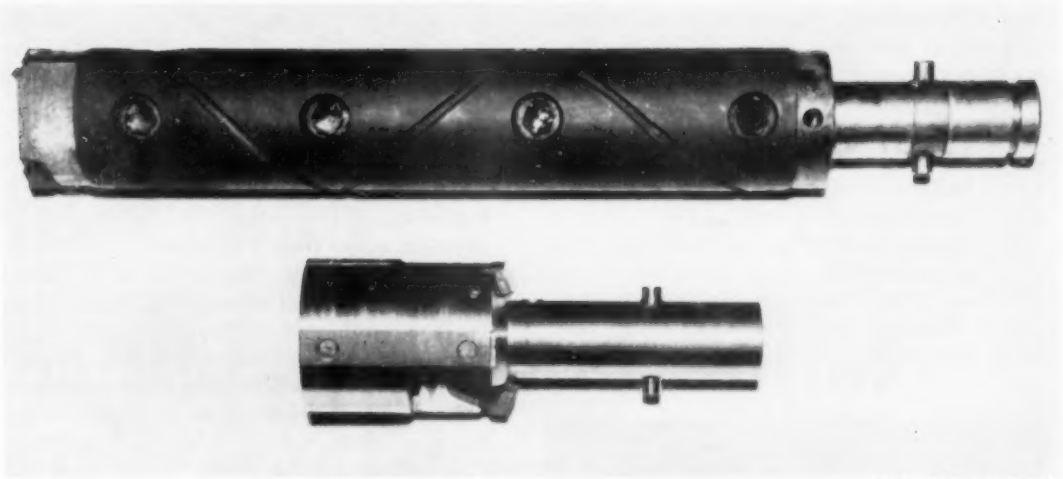
Bronze sleeve type packs, which rotated with the tube rather than with the reamer body, were also unsatisfactory. A reamer body designed with hydraulically actuated packs which expanded during reaming to compensate for wear gave no better results.

Experiments made with different tool geometries, operating procedures, coolants and cutter materials showed that all of these variables affect performance; however, runout continued to be a major problem. Accordingly, a new concept—pulling, rather than pushing a reamer through a tube—was investigated.

**Pull Reaming:** Pull reaming has several theoretical advantages over push reaming. When a boring bar is put under tension in pull reaming, *Fig.* 2, the straight-line forces set up resist deflection. This resistance will increase with increasing depth of cut and number of cutters. In push reaming, on the other hand, forces causing deflection increase with larger cutter loads.

These considerations led to a decision to try out pull reaming on 90-mm gun tubes. These tubes are forgings, with rough, cored holes. Preliminary engineering of a prototype tool was begun in July, 1955. Initial tests, *Fig.* 3, were conducted on a tube having a bore diameter of 3.200 inches and a length of 180 inches. Total runout of the bore with respect to the outer surface of the tube was 0.150 inch prior to reaming. Runout of the reamed tube was 0.005 inch. This promising result led to further tests.

**Pull-Reaming Tool:** The experimental pull-reaming tool is considerably shorter than a comparable push-reaming tool, *Fig.* 4. The pull-reamer body is hollow and supports two cutting tips, *Fig.* 5. During reaming, coolant is pumped through the hollow shank, emerging through holes adjacent to the cutting tips. Chips are washed through the reamer body into the reamed tube. The body of the cutter is only four inches long and there is littl possibility of chips lodging in the body itself.



U. S. Army photograph.

**Fig. 4. Conventional push reamer for 90-mm tubes is 23 inches long, as compared to pull-reamer length of only 10 inches.**

Four small and inexpensive maple strips serve as packs in the pull reamer. Neoprene packs are used in most push reamers in the 3.50-inch-diameter range, so the maple strip packs represent a considerable cost saving. Comparative data on push and pull reamers are shown in the accompanying table.

The cutters are tungsten carbide insert tips, 3/4 by 7/8 by 5/8 inch, brazed to 1/2 by 1 by 1 1/2-inch alloy steel holders. Pertinent cutter data follow:

| | |
|---|---|
| Lead angle | 22 deg |
| Radial-rake angle | -6 deg |
| Back-rake angle | 4 deg |
| Front-clearance angle | 7 deg |
| Side relief | 0.002 inch |
| Side-clearance angle | 6 deg |
| Peripheral land | 0.025 inch |
| Chip breaker | 0.015 × 0.05 inch |
| Nose | sharp |

**Test Setup:** The machine used for the tests is a No. 4 LeBlond hollow-spindle boring lathe. The breech end of the tube is held in a four-jaw chuck, and the center and muzzle ends are supported by roller rests. Two bronze bearing sleeves support the boring bar.

The reamer is started into the bore by means of a guide bushing which fits into an adapter housing secured to the muzzle end of the tube, *Fig. 6*. This adapter housing, when adjusted, turns true with the machine spindle axis. Adapters used with conventional push reamers are mounted directly on the machine ways and are frequently knocked off location when tubes are being placed in the machine, so the pull-reaming adapter housing represents a significant improvement.

In operation, the reamer is pulled into the guide bushing to within 3/4 inch of the muzzle face. Rotation is then initiated and feed engaged. Operation from this point is similar to conventional reaming. Coolant pressures are maintained at approximately 20 psi with a flow of 25 gpm. The coolant is a sulfurized fatty mineral-lard oil.

Speed during cutting is 135 fpm with feeds ranging from 0.018 to 0.225 ipm. In a typical test, a

**Characteristics and Costs: Two Reamer Types**

| Basis for Comparison | Push Reamer | Pull Reamer |
|---|---|---|
| Length (inches) | 23.5 | 10 |
| Weight (pounds) | 32 | 8 |
| Pack material | neoprene | hard maple |
| Cost for set of packs (dollars) | 25 | 0.56 |
| Number of tubes produced per set of packs | 40 | 25 |
| Maintenance time per run (hours) | 3.0 | 2.5 |
| Maintenance cost per run (dollars) | 21.62 | 17.52 |




U. S. Army photograph.

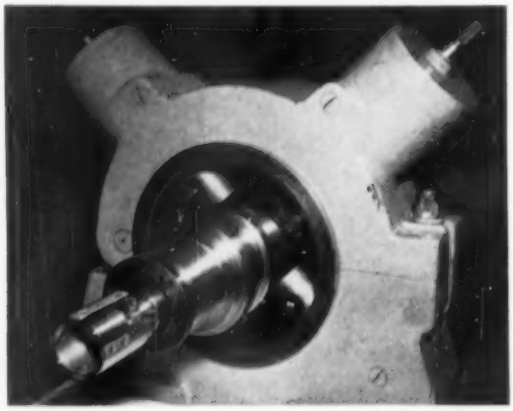
**Fig. 5. Details of pull-reamer construction.**

total of 601.5 cubic inches of stock was removed at a rate of 10.7 cubic inches per minute. Total machining time was 56 minutes.

**Test Results:** During pull-reaming tests on 90-mm tubes, core-hole diameters of approximately 2.9375 inches were enlarged to 3.535 inches. Run-out did not exceed 0.035 inch.

Pull reaming is being used in production to remove bore eccentricities which are so large that it would not be safe to use push reaming without expensive reworking to centralize the stock. Some twenty tubes have been corrected to date. Eccentricities of 0.195 inch are the largest which have been removed in production, but in tests eccentricities of up to 0.250 inch have been successfully corrected.

One of the principal advantages of pull reaming is that heavy chip loads can be sustained without causing axis deviation. In a typical test, a chip load of 0.300 inch was applied to each cutter. Axis deviation of the reamed tube was only 0.030 inch. At the present time, eccentricities of the bore to the tube axis have not exceeded 0.035 inch with pull reaming, while eccentricities of the push-reamed bores have ranged as high as 0.350 inch. Maximum eccentricities of ten pull-reamed bores, compared with ten push-reamed bores, are illustrated in *Fig.* 7.



*U. S. Army photograph.*

**Fig. 6. Bushing, fitted into an adapter housing, guides reamer into tube. Reamer is extended beyond starting position for purposes of illustration.**

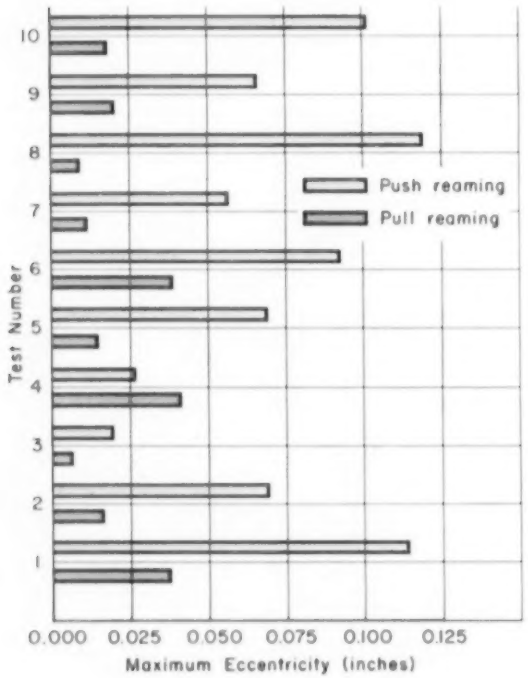



**Fig. 7. Maximum eccentricities of ten push-reamed zores compared with maximum eccentricities of ten pull-reamed bores. All reaming was done under production conditions.**

**Conclusions:** At present, the application of pull reaming is limited to semifinishing work. Control of bore size has not been maintained consistently enough to warrant using pull reaming for finishing cuts. It is anticipated, however, that a finish pull reamer will be perfected in the near future.

The proportion of bar diameter to length controls of the rigidity and vibration characteristics of the boring bar. Because of the eccentric distribution of bore stock and small size of the cored hole in 90-mm tubes, the bar diameter is limited to 2.5 inches. For best results the diameter should be at least three inches.

The problem of chip extraction in pull reaming is similar to that in trepanning and close control of chip conformation is essential. Further development work is required to improve this control.

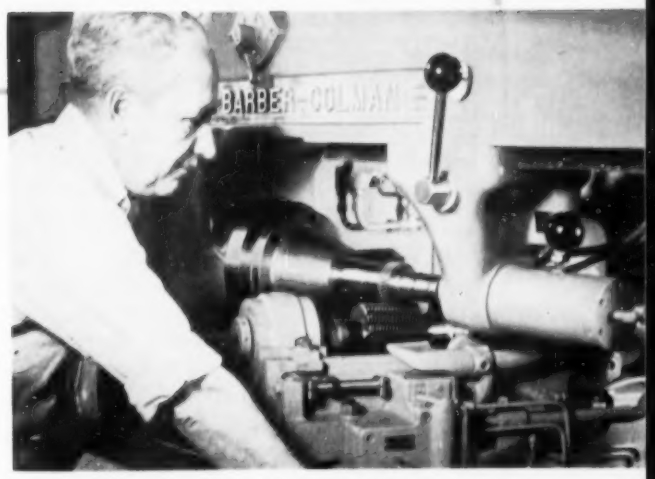
Chatter and chip flow problems will be minimized when pull reaming is applied to tubes with larger bores. The ratio of bar diameter to length will be more favorable, improving rigidity. By using the hollow-bodied reamer in larger bores, the possibility of chips accumulating within the reamer will be reduced, since the inside diameters of the reamers will be proportionately larger.

In pull reaming, as already pointed out, high cutting loads improve accuracy. With large cutter bodies, it will be possible to use more cutters and these can be adjusted for a maximum depth of cut. The only limitation to depth of cut is the amount of pressure which the cutter body can withstand.

The experimental and production work done up to the present time has illustrated the many advantages which can be obtained by replacing conventional push reaming with pull reaming. With further development work and the application of the process to larger bores, it should be possible to exploit these advantages to the utmost.

# inspecting involute helicoid forms with available pins

**By Edward C. Varnum***
Head, Operations Research
Barber-Colman Co.
Rockford, Ill.




**The workpiece, such as this precision helical gear, must be inspected after it is made and the results of the inspection must be meaningful.**

**The natural follow-up to presentation of precise formulas for over-pin measurement of helical forms with pins of the best size (*The Tool Engineer*, June 1957 and AGMA Paper 239.03, June 1957) is preparation of formulas for use with available pins. The formulas for measuring involute helicoids with available pins are here presented.**

PRECISE FORMULAS for over-pin measurement of helical forms apply equally well to helical gears, feed screws, worm threads, constant-lead barrel cams or any other helical form when the calculated size of pin can be used. When best-size pins are not handy, available pins must be used. Most inspection departments have sufficient variety of pins so the best size can be approached within four or five thousandths of an inch but this is not close enough for use of the precise formulas. When available pins are used, different calculations are required for each helical form. Calculation methods for helical forms with straight-sided axial profiles, such as Acme threads, have already been published (AGMA Paper 239.03). Methods for using available pins to measure involute helicoids will be outlined.

An involute helicoid has a transverse section that is an involute curve. In other words, an involute helicoid, in a transverse plane, is like an involute spur gear whose pressure angle corresponds with the transverse pressure angle of the helicoid. The best

*Senior member ASTE Rockford chapter.

## Nomenclature

$D$ = contact diameter

$d$ = best-pin diameter

$E$ = simplifying factor

$G$ = diameter of available pin

$K$ = kernel angle; the angle, in radians, in transverse plane between axial plane of worm and radial plane containing point of contact

$M$ = over-pin measurement

$Q$ = simplifying factor

$S_x$ = axial space width

$T$ = simplifying factor

$V$ = rate of change of the pin radius with respect to the contact radius

$\lambda$ = lead angle

$\varphi_t$ = transverse pressure angle

$\varphi_x$ = axial pressure angle

examples of involute helicoids are gears produced by hobs that are "straight sided in the normal." Some worms and screws may also have involute helicoid forms.

The general formulas for finding the "kernel" angle, pin diameter and over-pin measurement can be expressed in condensed form as:

$$\tan K = \frac{T \tan\lambda}{Q} \quad \text{.....(1)}$$

$$d = D\,T\,E \quad \text{.....(2)}$$

$$\& \; M = DQ\sqrt{1 + \tan^2 K} + d \quad \text{.....(3)}$$

when the following relationships exist

$$T = \frac{S_x}{D} - K \tan\lambda$$

$$Q = 1 + T \tan \varphi_x$$

$$E = \sqrt{1 + \tan^2\lambda + \tan^2\varphi_x}$$

These formulas are used by first solving Equation 1 for the kernel angle. This value of $K$ is used in Equation 2 to determine the diameter of the best-size pin. If this pin is obtainable, the same value of $K$ is substituted in Equation 3 to determine the over-pin measurement for an accurate gear. Unfortunately, however, the best-size pin is seldom at hand. An available pin, close to the desired size, must then be used when inspecting the gear. Since the available pin diameter is $G$, the difference between it and the best-pin diameter can be designated $\Delta G$. In practice, an available pin is selected with a diameter slightly larger than $d$ so that $\Delta G$ will be positive.

When determining $d$ and $M$ from the equations for the first time, it is not necessary to correct for the type of helical form. If the best pin is available, further calculation is unnecessary.

### Using Formulas with Involute Helicoids

To solve the available-pin problem for any special form, it is necessary to evaluate a contact diameter increment, $\Delta D$. This can be done by:

$$\Delta D = \frac{\Delta G}{V} \quad \text{.....(4)}$$

For an involute helicoid:

$$V = E\left[\tan\varphi_x - \frac{\tan\varphi_x - T\left(1 + Q + \dfrac{T}{\tan\varphi_x}\right)}{\left(\dfrac{Q}{\tan\lambda}\right)^2 + T^2 + 1}\right] \quad \text{.....(5)}$$

With the value of $V$ calculated by Equation 5, it is possible to calculate the new contact diameter after finding $\Delta D$ from Equation 4. The new con-

**Table 1—Results of Calculations in Example**

| First Round | Second Round | Third Round |
|---|---|---|
| $\tan\lambda$ = 1.1917536 | $\tan\lambda'$ (Eq. 7) = 1.1779341 | $\tan\lambda''$ (Eq. 7) = 1.1785935 |
| $S_x$ = 0.1018218 | $S_x'$ (Eq. 9) = 0.1055933 | $S_x''$ (Eq. 9) = 0.1054035 |
| $D$ = 0.7614876 | $D'$ (Eq. 8) = 0.7704213 | $D''$ (Eq. 6) = 0.7699903 |
| $\tan\varphi_x$ = 0.4023376 | $\tan\varphi_x'$ (Eq. 8) = 0.4411613 | $\tan\varphi_x''$ (Eq. 8) = 0.4393969 |
| $K$ (Eq. 1) = 0.0651953 | $K'$ (Eq. 1) = 0.0668576 | $K''$ (Eq. 1) = 0.0667736 |
| $d$ (Eq. 2) = 0.0685454 | $d'$ (Eq. 2) = 0.0721816 | $d''$ (Eq. 2) = 0.0719993 |
| $G$ = 0.0720000 | $G$ = 0.0720000 | $G$ = 0.0720000 |
| $\Delta G$ = 0.0034546 | $\Delta G'$ = −0.0001816 | $\Delta G''$ = 0.0000007 |
| $V$ (Eq. 5) = 0.3866896 | $V'$ (Eq. 5) = 0.4212614 | |
| $\Delta D$ (Eq. 4) = 0.0089337 | $\Delta D'$ (Eq. 4) = −0.0004310 | |
| $\tan\varphi_t$ = 0.3376013 | $\tan\varphi_t'$ = 0.3745212 | $\tan\varphi_t''$ = 0.3728146 |
| $\varphi_t$ = 18.65475 | $\varphi_t'$ = 20.53199 | $\varphi_t''$ = 20.44619 |
| inv $\varphi_t$ = 0.0120145 | inv $\varphi_t'$ = 0.0161704 | inv $\varphi_t''$ = 0.0159613 |
| cos $\varphi_t$ = 0.9474632 | cos $\varphi_t'$ = 0.9364765 | cos $\varphi_t''$ = 0.9370007 |
| | | $M''$ (Eq. 3) = 0.8634409 |

tact diameter is found from

$$D' = D + \Delta D \quad \ldots\ldots(6)$$

The new lead angle at $D'$ will have its tangent given by:

$$\tan\lambda' = \frac{D \tan\lambda}{D'} \quad \ldots\ldots(7)$$

To determine $S_x'$ and $\tan\varphi_x'$, the transverse pressure angle must first be computed at the original contact diameter:

$$\tan\varphi_t = \frac{\tan\varphi_x}{\tan\lambda}$$

The transverse pressure angle at the contact diameter of the available pin is found from:

$$\cos\varphi_t' = \frac{D \cos\varphi_t}{D'}$$

because the transverse section is an involute curve. The new axial pressure angle has a tangent whose value is found by:

$$\tan\varphi_x' = (\tan\varphi_t)(\tan\lambda') \quad \ldots\ldots(8)$$

The involute curve in the transverse plane is again used to determine the transverse space width. This is transferred to the axial plane to give the following formula for the new axial space width:

$$S_x' = S_x + D \tan\lambda \ (\text{inv}\varphi_t' - \text{inv}\varphi_t) \quad \ldots\ldots(9)$$

Having found values for $D'$, $\tan\lambda'$, $\tan\varphi_x'$ and $S_x'$, Equation 1 is solved a second time, using values for $H'$, $E'$ and $Q'$. Using the value of $K'$, Equation 2 can be solved for $d'$. The value of $d'$ should agree closely with $G$. If it does not, new values are calculated for $G'$, $\Delta D'$, $D''$, $\tan\lambda''$, $\tan\varphi_x''$ and $S_x''$. Equation 1 is solved a third time and a value for $d''$ is computed from Equation 2. This process can be repeated indefinitely to achieve any desired accuracy but from practical experience it has been found that more than three rounds of calculations are unnecessary.

If an electronic computer is used, it can be programmed to "branch" on a specified small difference between $d$ and $G$. When the small difference exceeds the calculated difference, the computer proceeds to evaluate M from Equation 3. Whether an electronic computer is used or not, Equation 3 is solved with that value of $K$ that gives the desired closeness between the values of $d$ and $G$.

### Illustrative Example

To show how these formulas are used, a 14-tooth helical gear having a 40-deg helix angle, 14½-deg normal pressure angle and a normal diametral pitch of 24 can be studied. It is assumed that available pins have diameters of 0.072 inch. It is desired to determine the over-pin measurement for no backlash —the reference dimension often used on a gear print.

For these specifications, the following numerical values are found:

$$\lambda = 50;\ \tan\lambda = 1.1917536;\ S_x = \frac{\pi}{48 \cos 50} = 0.1018218$$

$$D = \frac{14}{24 \sin 50} = 0.7614876;\ \tan\varphi_x = \frac{\tan 14.5}{\cos 50} = 0.4023376$$

Since the procedure has been outlined, it is easiest to tabulate the result of the computations, as in TABLE 1. It can be seen that the pin diameter calculated is not the same size as the diameter of the pins available so that computations will have to be continued. Although the value of $d'$ is within 0.0002 inch of the available pin diameter, a third round is calculated. The value of $d''$ is within one microinch of the diameter of the available pins so the measurement over the pins is calculated with Equation 3.

The final result of these calculations is that the over-pin measurement is 0.86344 inch for an accurate gear and two pins whose diameters are 0.0720 inch. This is in complete agreement with the numerical results given by the Zahorski Method (The Van Keuren Handbook No. 36, 1955, page 137) for the no-backlash condition. Where teeth are thinned by 0.002 inch, the Zahorski approximate method gives a result of 0.85744, compared with the more accurate result, achieved by the procedures outlined in this article, 0.8573076, TABLE 2.

By comparing $d'$ and $M'$ with $d''$ and $M''$ in TABLE 2 it can be seen that a pin diameter variation of 3 in the fifth decimal place is reflected by a variation of 14 in the fifth place of the over-pin measurement. This emphasizes the accuracy required in measuring pins. When fifth-place accuracy is held in pin sizes, approximate formulas are inadequate for yielding fifth-place accuracy in the over-pin measurement.

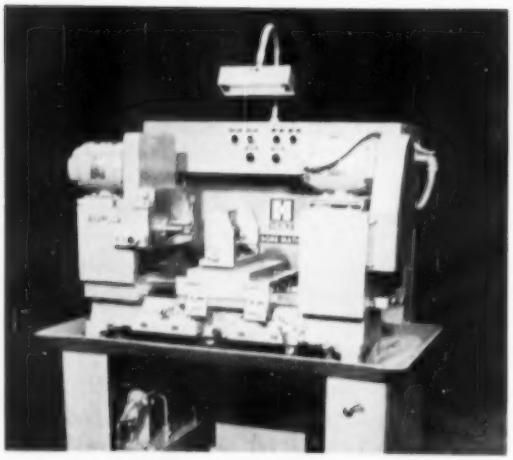
**Table 2—Determination of Over-Pin Measurement for Thinned Teeth**

| First Round | | Second Round | | Third Round | |
|---|---|---|---|---|---|
| $D$ | 0.7614876 | $D'$ | 0.7648879 | $D''$ | 0.7648058 |
| $S_x$ | 0.1049332 | $S_x'$ | 0.1063277 | $S_x''$ | 0.1062934 |
| $\tan\varphi_x$ | 0.4023376 | $\tan\varphi_x'$ | 0.4177025 | $\tan\varphi_x''$ | 0.4173402 |
| $\tan\lambda$ | 1.1917536 | $\tan\lambda'$ | 1.1864556 | $\tan\lambda''$ | 1.1865830 |
| $K$ | 0.0571657 | $K'$ | 0.0677686 | $K''$ | 0.0677534 |
| $d$ | 0.0706718 | $d'$ | 0.0720332 | $d''$ | 0.0720004 |
| $M$ | 0.8516150 | $M'$ | 0.8574483 | $M''$ | 0.8573076 |
| $Y$ | 0.3906053 | $Y'$ | 0.4040097 | | |

If the variety of gears processed is extensive, programming of electronic computers should be considered. A computer can remove the tedium of working through the transcendental equation and the numerical substitution in the remaining formulas. Regardless of the method of using these formulas, they offer the opportunity of accurately determining over-pin measurements for inspecting involute helicoids.

*designed for*
# PRODUCTION

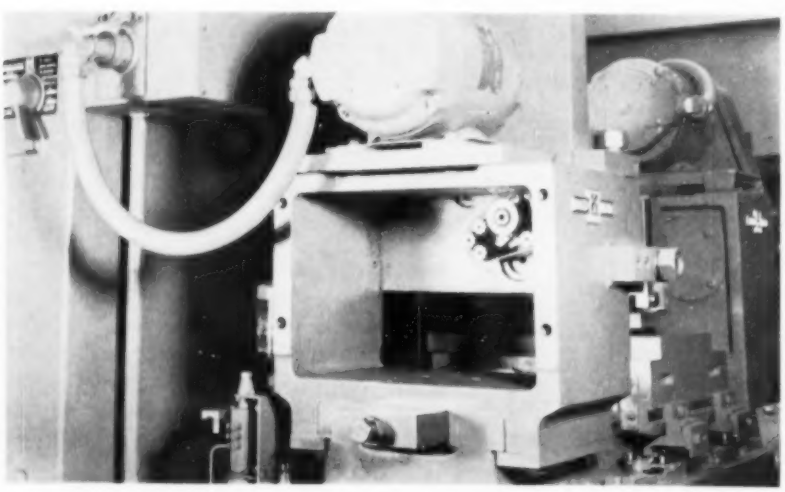
## Finishing Machines Made from Standard Units



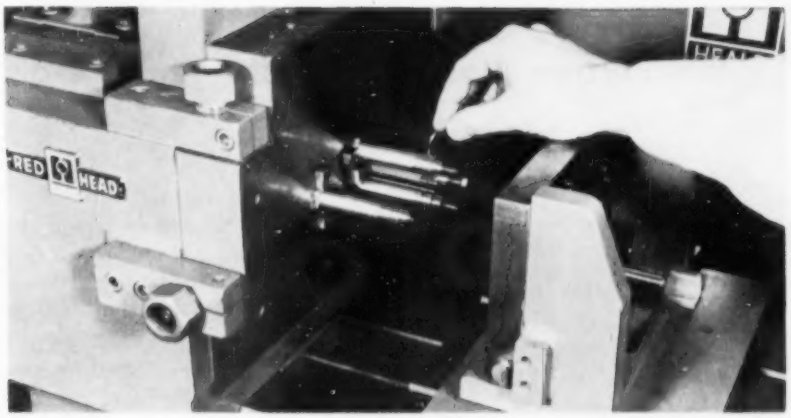
TYPICAL MACHINE set up for operations on both sides of a workpiece. A multiple-spindle unit is used on the left end of the machine, with a single-spindle head on the right. A cutting-fluid reservoir and pump can be added to any of the machines at any time.

Designed around standard, interchangeable units or "building blocks," this boring machine can be set up as, or altered to be, any of dozens of basic machines. With combinations of tooling and fixtures, the machine can perform straight and taper boring, straight and taper turning, facing, chamfering, grooving, reaming and, with special attachments, contour or spherical boring or turning, and slot milling. Either the work or the tools can be rotated and many different operations can be performed simultaneously or in sequence. Through selective assembly, a special machine can be produced for the price of a standard.

Standard units for these Model 0 Bore-Matics include: base-ways, having a hydraulically operated table and a hydraulic power unit with controls; single or multiple-head units, complete with motor drive; hydraulic cross-feed units for the heads; and either air or hydraulically operated chucks. The table of this machine, developed by The Heald Machine Co., is operated, through a rack and pinion, by a hydraulic cylinder. This cylinder is at the rear of the machine where fluid heat will not affect machining accuracy.



HEAD UNIT is keyed and clamped on the ways for accuracy. Motor, with hinged tension-plate, is mounted on top of this unit. Individual boring heads are complete with spindle, bearing, cylindrical housing, drive pulley and provision for attaching tooling. All boring heads in a cluster are driven by a single belt. Stepped sheaves on the motor and head unit give four different speeds.



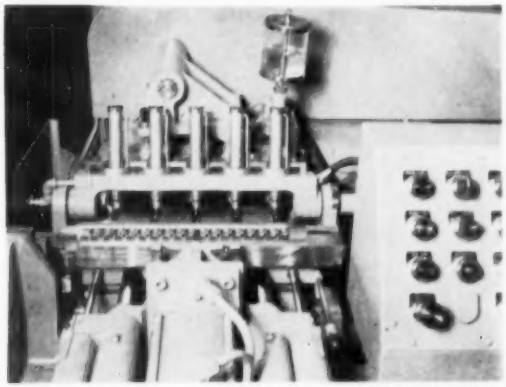
MULTIPLE-SPINDLE head uses precision boring heads that can be clustered as close as ¾ inch on centers. For closer center distance, a cross-slide is used for indexing to another cluster on the same plate. A spindle plate is bored for each multiple-hole job or, if holes do not overlap, one plate can be used for several cluster patterns by mounting heads only in the holes required for each job.

# Bearing-Race Honing Machine Cuts Costs

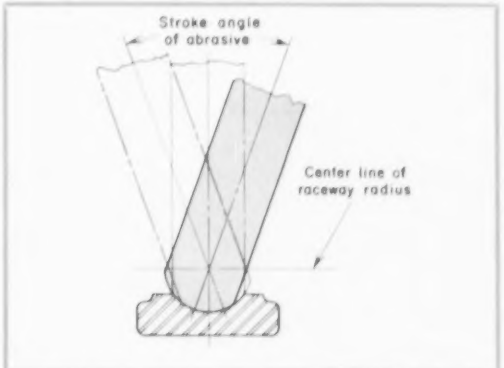
As antifriction bearing loads and operating speeds have increased, characteristics of raceways have become more critical. Curvature across the raceway, waviness around the raceway, and surface roughness and lay must be closely controlled to minimize noise and friction, and maximize life. Bearing performance is improved by machine honing to correct geometrical faults. Machine honing is more economical than hand methods.

Internal race-honing machines, developed by Micromatic Hone Corp., have three or five spindles, depending on bearing size, and automatically handle and process bearing rings. Abrasive sticks are automatically fed and the machine stops when the abrasives require replacement.

This machine combines motions to generate a true geometric form, keeps the abrasive sticks self-dressing, offers low-velocity abrading with controlled pressure and permits the abrasive stick to align itself with the neutral center of the raceway.



TAPERED ARBORS can be seen directly below the tool bridge on this inner-ring honing mchine. End clamping arbors are used to hold larger inner rings. Workpieces are pressed on the arbor and then pulled back against a plate that locates them under the abrasive sticks. These sticks oscillate and, as the ring rotates, they sweep across the raceways to remove irregularities.




TOOLS are mounted on an oscillating bridge that pivots about the true center of the raceway arc. During most of the cycle, the bridge oscillates rapidly to give full coverage of the raceway and to remove stock rapidly. Oscillating speed is automatically reduced for the rest of the cycle so the finished rings have all abrasive marks running circumferentially.

# DESIGNED FOR PRODUCTION

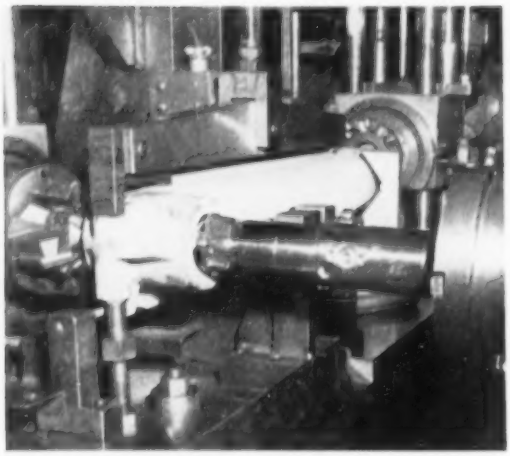
## Fixture Permits Simultaneous Operations

**By F. W. Rosh**
**Tool Engineer**
**DeWalt, Inc.,**
**Subsidiary of AMF,**
**Lancaster, Pa.**

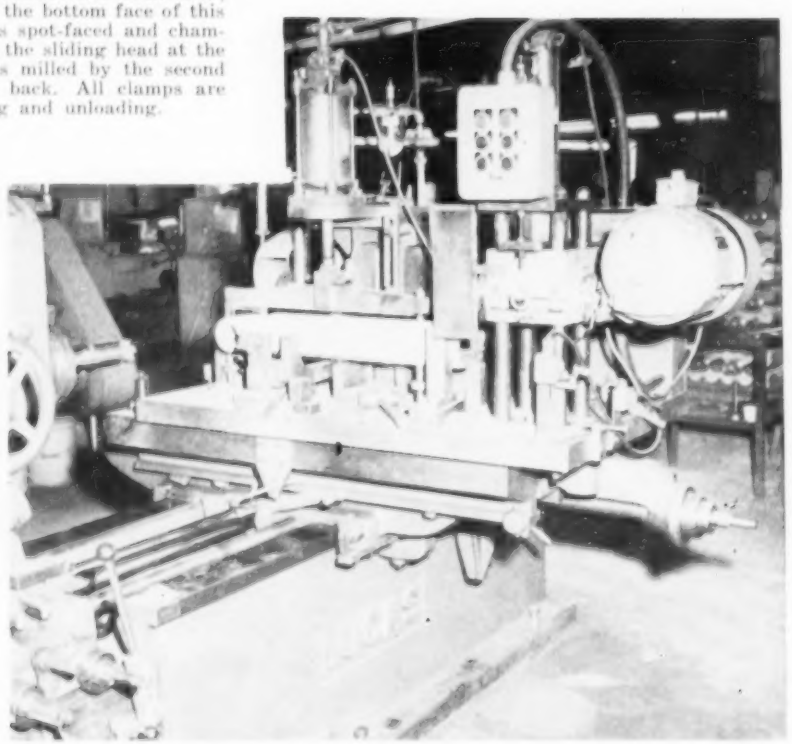
Until this fixture was designed, machining of the arm of a radial-arm saw required operations on several machines. Now, two spot-facing and chamfering operations, one boring operation and one milling operation can be done simultaneously on a Lucas single-spindle boring machine. Increased production was the natural result of introducing this special fixture design.

In effect, the fixture converts a single-spindle machine into a three-spindle machine. The workpiece is mounted in the fixture on a pin, a steel plate and a V-block. It is clamped in position by fixture details mounted on the piston rods of three air cylinders.

The two extra spindles are obtained by mounting Master sliding heads at right angles on the fixture. These sliding heads are timed to operate with the machine spindle.



MACHINE SPINDLE bores the pedestal hole in the arm, and spot-faces and chamfers the bottom face of this hole. Top face of the hole is spot-faced and chamfered by tooling mounted on the sliding head at the left. The end of the arm is milled by the second sliding head, visible at the back. All clamps are air-actuated to speed loading and unloading.



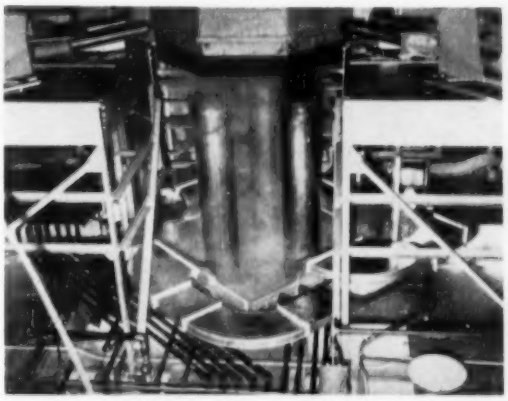
SPECIAL FIXTURE mounted on standard boring machine gives two additional operating spindles and accurately locates the part. The entire fixture rides with the table.

# LARGE EXTRUSION BILLETS
## Cast Continuously

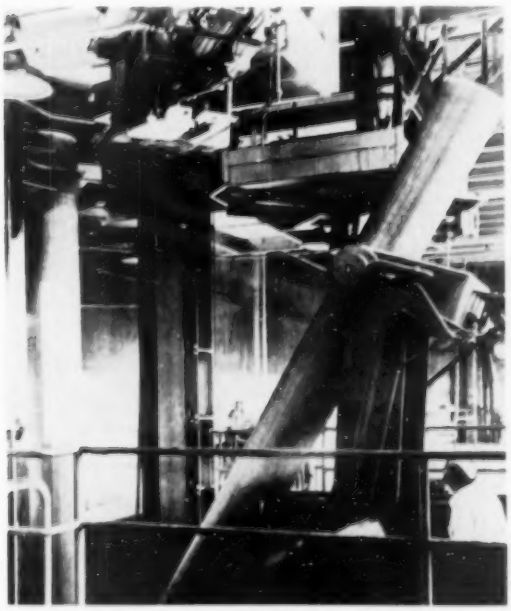
Vertical casting machines are helping in the U.S.A.F. Heavy Press program by providing uniform extrusion billets of even highly alloyed metals such as 6061, 6062, 2024, and 7075. The machines can produce aluminum-alloy billets up to 25 feet long and 20 inches in diameter. External surfaces are good as cast but internal surfaces of hollow billets have to be scalped.

These machines operate at variable billet lowering speeds up to 8 ipm, and a fixed billet lifting speed of 90 ipm. Hydraulic equipment for lowering and lifting the mold stool supporting platform comprises a cylinder with a 30-foot stroke and a billet load capacity of 10 tons. Kaiser Aluminum & Chemical Corp. and Loma Machine Mfg. Co., Inc., cooperated to conceive, design and build this equipment that is used at Kaiser's Halethorpe Works.

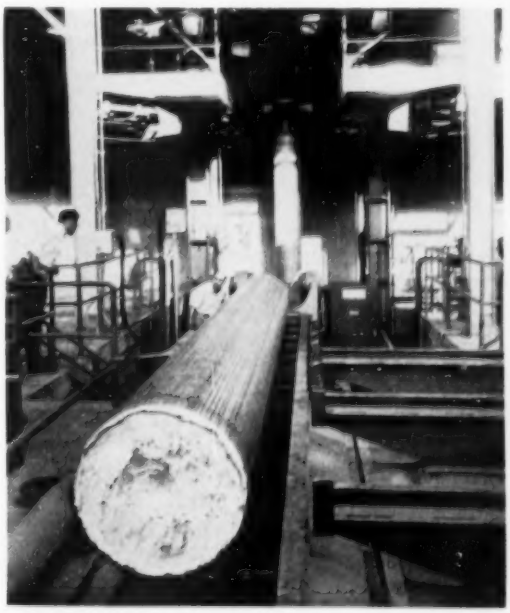
High productivity is achieved with this casting equipment partly because of associated billet handling equipment. Cranes are not needed.



THREE 18-inch-diameter billets being cast simultaneously by a "direct-chill" semicontinuous casting machine. Hot metal is obtained from gas-fired reverberatory furnaces. It flows from the holding hearth of the furnaces through a refractory-lined and electrically heated swinging trough into a distributing pan and finally through spouts in the water-cooled aluminum molds.



BILLET GRAB ARM, mounted on a carriage that travels on rails, picks up one cast billet. By tilting the arm and moving the carriage away from the casting pit, the billet is deposited on a sloped idle-roller conveyor.



FIVE-TON scale is incorporated in the idle-roller conveyor so billet weight can be found easily. The billet is then pushed to the receiving rack where it is reflectoscoped prior to transfer to the homogenizing furnace or the billet saw.

# DESIGNED FOR PRODUCTION

## Special Machine Speeds Production

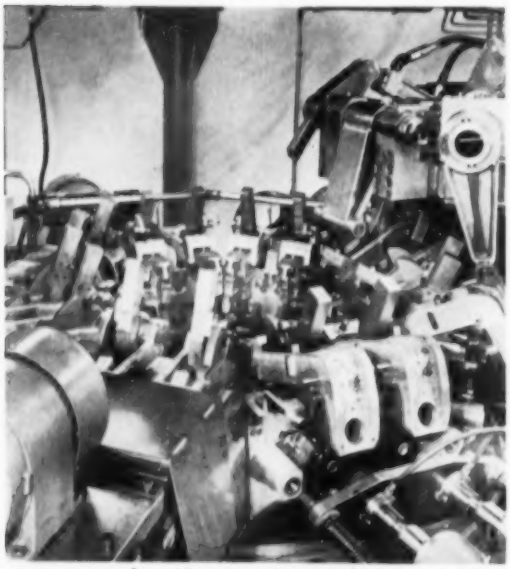


ROTARY INDEXING machine automatically positions workpieces and performs several finishing operations on the sintered-iron bore and thrust face of a plastic water-pump impeller.

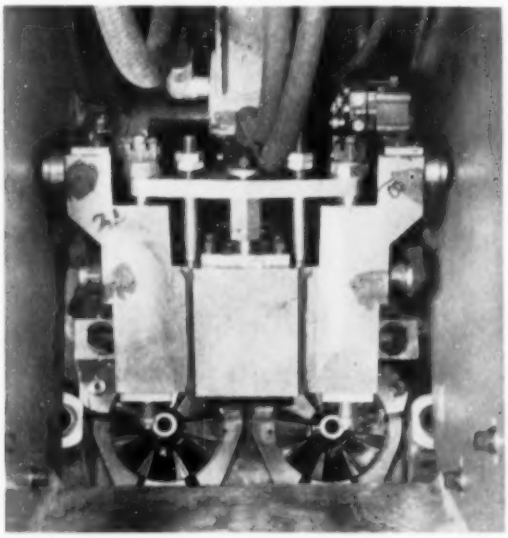
This automatic machine spot-faces, reams, bores and bearingizes the sintered-iron hub of an automobile water-pump impeller. All machining heads are mounted on standard way units, also developed by the Expert Automation Machine Co. These electrically controlled, hydraulically operated way units advance and return at 300 ipm and develop a thrust of 7000 lb.

The way-unit feed valve and hydraulic cylinder are manifold-connected to an internally drilled manifold block. This design avoids all piping within the unit which reduces the possibility of leakage. Adjustable dogs control the way unit operation.

During automatic index from one station to another, a shot pin retracts, the table raises, indexes and lowers, and the shot pin is driven home. This indexing sequence prevents skidding of the table on the reference pads and prevents pad wear. The table is driven by a cam-index mechanism and, because of the cam design, starting and stopping loads on the motor reflect only the cam system inertia.



INDEX TABLE has 16 overcenter toggle type positioning and clamping fixtures for parts that are machined two at a time. Individual parts are manually loaded into three centering stops, and the clamping plate automatically seats the impeller. The clamps are actuated by an overhead, pivoted pusher arm.



PARTS are automatically unloaded after an overhead pivoted pusher arm releases the fixture clamp. Rubber tips swing into the impeller bores, the tips are expanded by hydraulic pressure and the unload mechanism swings out. When pressure is released, the tips resume their normal dimensions and the impellers drop into a chute.

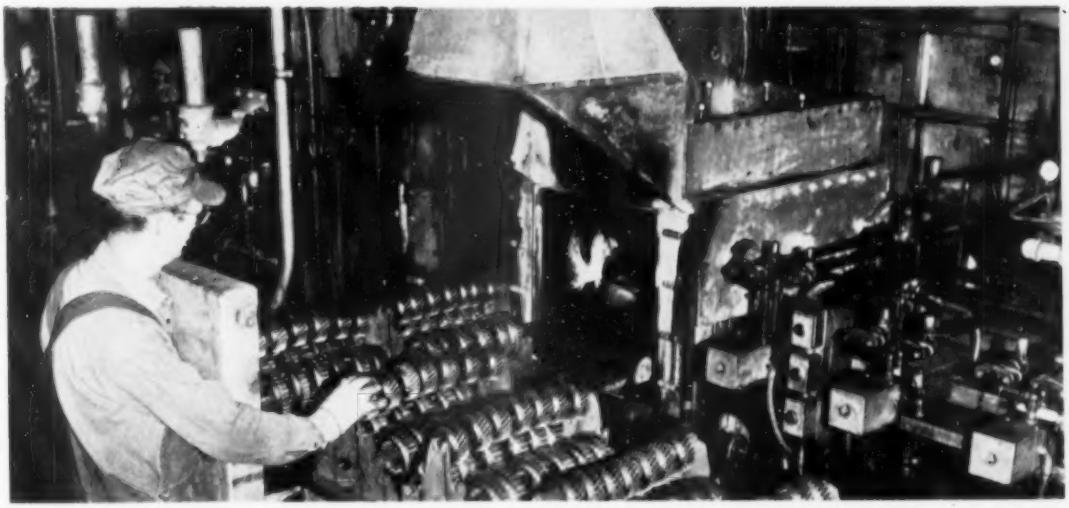


**Fig. 1. Truck transmission gears, on high-alloy trays, are loaded into gas carburizing furnace that has capacity of 42 trays.**

# modernized Heat-Treating Facility pays off

MODERNIZATION of a heat-treating facility can pay large dividends in improved quality of work and reduced production time. A gas-carburizing setup, for treating truck gears, kingpins and shafts at the Fort Wayne works of International Harvester Co., was found to be expensive and inefficient, and has been replaced by better furnaces and mass marquenching.

Under the former system, most of the process parts had to be straightened after heat treating. Parts had to be quenched individually and fished out of the quenching medium. This involved high labor costs. Also, product quality was unsatisfactory. The conventional quench into oil or water at 90 to 100 F hardened the parts from the outside, creating high internal stresses. These stresses resulted in part distortion and the need for subsequent straightening. Under the new system, parts are economically handled in batches, *Fig.* 1.

In marquenching, hardening is from the inside out and is an ideal treatment for heavily loaded parts such as truck gears. Marquenching permits transformation of austenite to martensite by means of an interrupted quench, with oil at 400 F and room-temperature air as the quenching media. Pieces are placed in the quenching bath at a temperature just above that at which martensite starts to form, $M_S$ in *Fig.* 2, in the carburized case. They are held in the bath long enough to permit the pieces to acquire a uniform temperature throughout and then air cooled to room temperature.

Transformation to martensite occurs during the relatively slow air-cooling step and, since the temperature gradient characteristic of conventional quenching is absent, the stresses set up by the transformation are much lower. Because the stresses are lower, there is less distortion and cracking.

Furnaces used in the modernized heat-treating plant operate with radiant-tube carburizers made by Surafce Combustion Corp. Atmospheres in these furnaces consist of RX gas as a carrier and 1050-Btu natural gas as the activator. About 1250 cubic feet of RX gas are used with 35 cubic feet of natural gas and the furnace atmosphere is changed about 1.3 times per hour.

Furnaces are operated on different cycles to

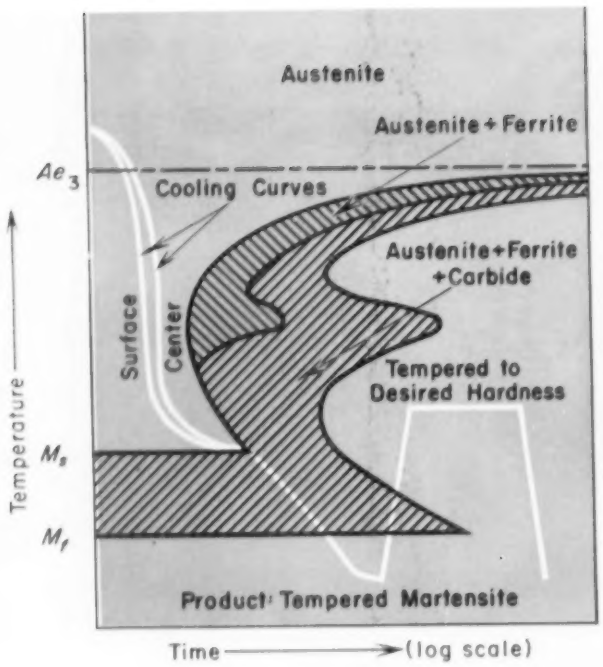



**Fig. 2. (left) Phase diagram indicating marquenching transformation of austenite to martensite.**

**Fig. 3. (below) Tray of transmission countershafts ready to enter the marquenching bath on an elevator just outside the carburizing furnace. In practice, parts are enveloped by the furnace atmosphere and not exposed to air.**



produce case depths of: 0.025 to 0.035 inch, 0.031 to 0.047 inch and 0.047 to 0.063 inch. Close control during the cycle results in the concentration of carbon in the case that results in optimum hardness of the structure. By former methods, carbon concentration was held in the range of 1.10 to 1.20 percent on all types of carburized parts. The new furnaces are controlled to yield a surface carbon concentration of 0.85 to 0.95 percent.

Quenching is accomplished in 1600-gallon-capacity tanks of special design, located at the side discharge door of each furnace. Material discharged onto the elevator, *Fig.* 3, is submerged in the 400-F oil without appreciable intermediate cooling. Flow of oil in the tank is greatest at the submerged level. Furnace atmosphere is carried over the quench tank so that parts are not exposed to air before quenching.

As a result of marquenching, combined with close control of carbon concentration in the case, a fine martensitic case structure is obtained. One typical steel gear has the following analysis: C, 0.21; Mn, 0.76; Ni, 3.45; Cr, 0.08; Si, 0.23; and Mo, 0.25 percent, approximately corresponding to an SAE-4320 steel. Marquenching results in the following hardnesses on various portions of this gear: teeth surface, 60.5 $R_C$; core at the pitch line, 43 $R_C$; core at the root line, 38 $R_C$; and core ⅛ inch below the root, 38 $R_C$.

Because heat-treating stresses are reduced, service life of the gears has increased 100 to 200 percent, compared with gears heat treated by former methods. Load-carrying capacity, as determined by dynamometer tests, has been increased by 15 to 20 percent. Reduction of distortion has resulted in considerable savings. In one transmission with 13 carburized parts, for example, five parts were formerly press quenched, five were plug quenched, one was quenched individually and two were batch quenched. Now, these parts are all batch quenched successfully.

Advantages of marquenching include: elimination of quenching dies, plugs for splined bores and individual handling during heat treating, increased load-carrying capacity and longer life for gears due to reduced residual stresses, and increased production.

Success of the new carburizing and marquenching treatments is due in part to the extensive use of specially designed high-alloy trays and furnace parts, which withstand sevère conditions of 1700-F temperatures, carburizing atmospheres and repeated thermal shocks during quenching. Trays used to support the gears in the carburizing furnaces are made of Type HT cast alloy. These trays are rigid but lightweight, which is a help because the special-alloy fixtures that hold the gears are heavy. Radiant tubes and other furnace parts are also made of Type HT castings.

Containing up to 1.25 percent silicon for increased resistance to carburization, this alloy operates satisfactorily at temperatures up to 2100 F in oxidizing atmospheres and up to 2000 F in reducing atmospheres. As with all high-nickel alloys, this one is fully austenitic and it has good hot strength. It is used in the cast form because welding or other fabricating joints could serve as stress concentration points that might result in failure at these temperatures and under these atmospheres.

# Bulge Forming with expanding mandrel machines



By Wayne Ewing*

President
Arrowsmith Tool & Die Corp.
Los Angeles, Calif.

**Recent developments in equipment and methods have extended the applications of expanding-mandrel machines for "bulge" or "expansion" forming, making it possible to form certain types of sheet-metal parts to close tolerances at low cost.**

EXPANDING-MANDREL MACHINES are coming into increasing use in the aircraft industry for stretch-forming sheet-metal parts. Most of these parts, such as jettison fuel tank shells and jet-engine components, have the same general shape as the frustum of a cone. In forming, a workpiece is positioned over forming shoes mounted on a mandrel, *Fig.* 1. As the mandrel is expanded, the metal is stretched and conforms to the contours of the forming shoes.

This forming method has several advantages. Tooling is relatively simple and forming shoes can

*Senior member ASTE Los Angeles chapter.



**Fig. 1. Operator placing the tail cone of a 200-gallon jettison fuel tank on mandrel for forming operation at Pastushin Industries. Machine adjustments are made from control panel at right.**

be produced in a few days at comparatively low cost. Further, the forming shoes can be quickly changed—a desirable feature when production runs are short.

On many applications, it is possible to consistently hold workpiece diameters within 0.002 inch. Roundness can also be closely controlled. Under production conditions, out-of-roundness of a typical part—a 20-inch diameter fuel tank nose section—is held to 0.004 inch total indicator reading.

Expanding-mandrel machines, for which patent applications have been made, are available in a wide range of sizes and tonnages and are capable of stretch-forming stainless steels as well as more easily formed metals. Workpieces such as a jet engine part 24 inches in diameter and 38 inches in length, made from 0.125-inch-thick 347 stainless steel, are

**Elongation of Expansion-Formed Parts**

| Material Grade | | Elongation* (percent) |
|---|---|---|
| 3S-O | Aluminum | 25 |
| 2S-O | Aluminum | 20 |
| 24S | Aluminum | 9 |
| 61S | Aluminum | 15 |
| 347 | Stainless steel | 35 |
| — | Cold-rolled steel | 25 |

*Safe operating limit.

formed with a minimum of failure.

Metals can usually be stretched a greater amount on an expanding-mandrel machine than is possible with other stretch-forming methods. The reason for this is that the ends of the workpiece are not clamped and metal is free to flow from both ends of the workpiece during forming. The length of the workpiece is decreased as its diameter is expanded. Percentages by which various materials can be elongated without failure are shown in the accompanying table.

The free flow of metal accounts for another advantage of expanding-mandrel forming methods; as material is formed its thickness is reduced by only half the percentage of elongation. For example,

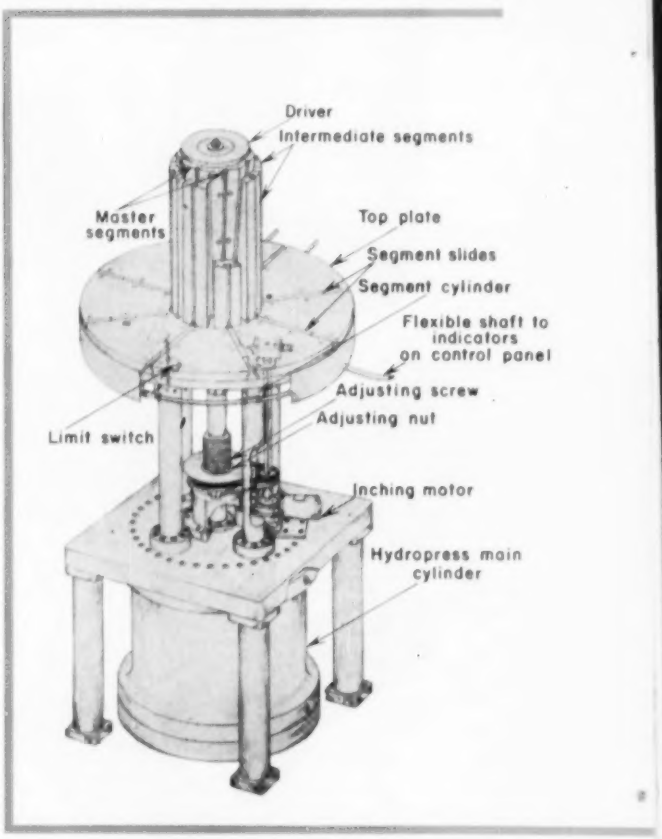



**Fig. 2. A 300-ton expanding-mandrel machine. Forming shoes have been omitted from this drawing.**

stretching a material 20 percent results in a 10 percent reduction in wall thickness. Accordingly, the process is well-adapted for conditions where minimum metal thinning during forming is necessary.

Local thinned areas can also be held to a minimum. This is accomplished by changing the position of the workpiece on the forming shoes three or four times during forming. Flat spots that might be formed over the gaps between the expanded forming shoes are also eliminated.

There is little movement of the workpiece on the shoes as the mandrel is expanded, so there is little galling. The smooth surface is desirable from an appearance standpoint and is functionally important in many aircraft parts. The absence of scratches and other blemishes also reduces the possibility of the metal tearing during forming.

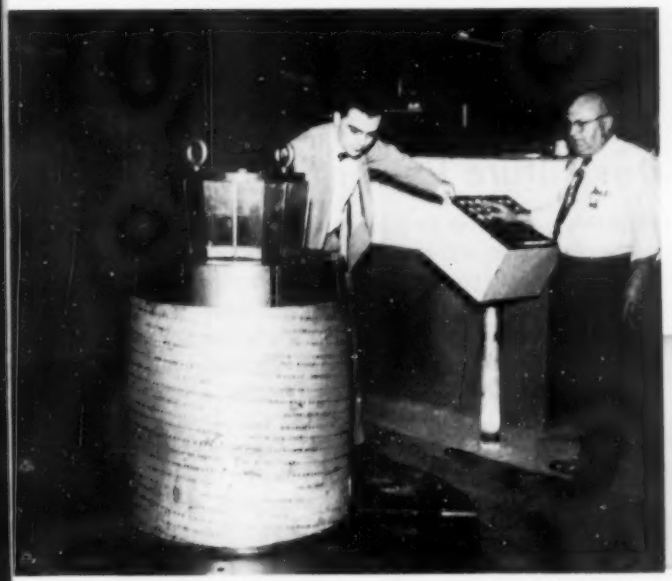
At present, there are some 30 expanding-mandrel machines in the United States, ranging from 50 to 650 tons in capacity. Construction details of a 300-ton machine are shown in *Fig.* 2.

The machine is hydraulically operated. Components of the mandrel are a driver, tapered master segments attached to the driver and tapered intermediate segments. Forming shoes are mounted on the intermediate segments by means of T-bolts. Heads of the bolts fit into T-slots in the intermediate segments. The driver is connected to the piston rod of a master hydraulic cylinder.

At the start of forming operations, the workpiece is slipped onto the mandrel, *Fig.* 3, where it rests on a segmented top plate. The driver is in the "up" position. During forming, the driver is pulled downward and the camming action of the master segments against the intermediate segments expands the mandrel, forcing the forming shoes against the part. Hydraulically operated slides located between the sections of the top plate maintain constant pressure on the intermediate segments during forming, keeping them in contact with the master segments. On the upstroke of the driver, the slides push the intermediate segments inward so the workpiece can be removed.

Length of the downstroke is controlled by an adjusting screw and nut, *Fig.* 4. At the bottom of the stroke, the adjusting nut comes against a stop block, giving positive control over the expansion of the mandrel and, hence, the diameter of the workpiece. Length of the upstroke is controlled by an adjustable limit switch.

The adjusting nut is turned on the screw by an inching motor which drives a sprocket and roller chain assembly. Adjustment is accomplished from a remote control panel, equipped with a reversing



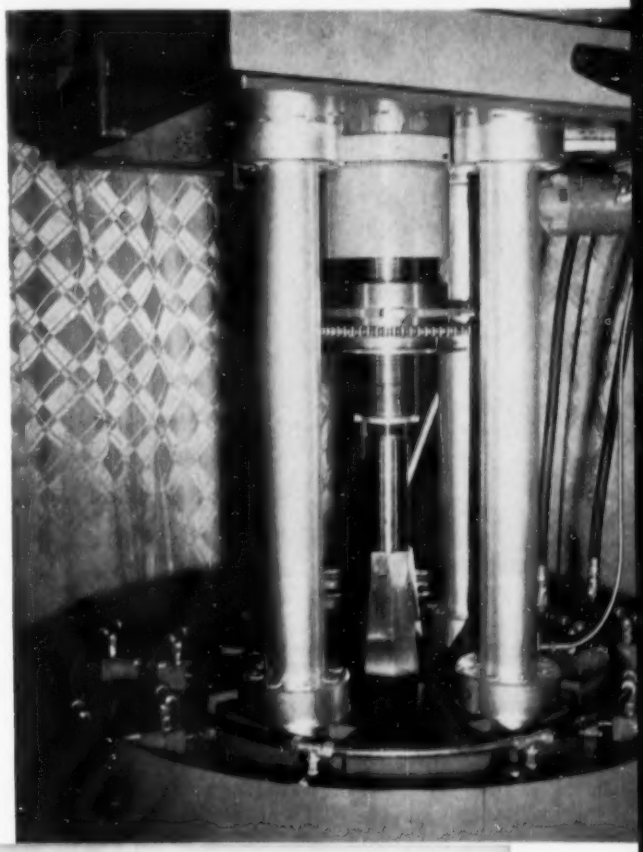


**Fig. 3.** (left) **Stretching an 0.060-inch-thick stainless steel part at Marquardt Aircraft Corp.**

**Fig. 4.** (above) **Length of downstroke is controlled by a positive stop below the stop nut.**




**Fig. 5. All machine settings are made from control panel, which is connected to machine by flexible shafts. These make it possible to install control panel in any desired location.**

switch and inching button. A flexible shaft, actuated by the inching motor through a square shaft and a gearbox, is connected to a dial on the control panel, *Fig.* 5. This dial indicates the adjustment of the nut. Once the correct setting for a workpiece has been established, the dial reading and part number are recorded for reference in setting up the same job again.

A reservoir in the top of the driver furnishes lubricant to spring-loaded ball-bearing type oilers in the driver itself. These oilers operate only when the master segments are engaged on the intermediate segments. Grooves in the faces of the intermediate segments facilitate uniform distribution of lubricant.

Hydraulic pressures of approximately 1000 psi are commonly employed with expanding-mandrel machines. Hydraulic equipment operating at this pressure is readily available and experience has shown that less maintenance will be required when operating at 1000 psi than at higher pressures.

The advantages of expanding-mandrel stretch forming may be summarized as adaptability to both short and long production runs, plus the ability to form consistently accurate parts, *Fig.* 6. The design of the machine is being continuously improved as a result of an extensive research and development program, making it possible to exploit these advantages to the fullest extent.



**Fig. 6. Fifty-ton machine used for rocket and missile component manufacture by The Emerson Electric Mfg. Co., St. Louis, Mo. The ID and contour of the magnesium part shown are held within ± 0.002 inch.**

## Package Reactor Test Indicates Future Power Source

Preview of atomic power possibilities came with successful completion of a 700-hour performance test of the Army package power reactor. The experiment was made at Fort Belvoir, Va., by Alco Products, Inc. which built the plant for the Atomic Energy Commission and the U. S. Army Corps of Engineers.

The APPR is a prototype small package power reactor designed to furnish power to remote military installations where cost of electricity from diesel plants is such that nuclear power plants offer competitive advantages. Successful results of the test now confirm that nuclear power plants would be adaptable and reliable for such application.

The power plant was operated at a load stipulated by the Commission. During the operating period shutdowns required for adjustment and repair of plant components amounted to only eight hours. For more than 600 hours of the test, electricity was generated at a rate exceeding the design output of the plant. A total of 1,181,000 kilowatt hours of electric power was produced during the experiment. This would be a sufficient amount of electricity to meet the requirements of 300 to 400 homes for one year.

The APPR contract is the first fixed price reactor construction contract awarded.

# how to use ceramics on today's machine tools

By M. C. Shaw*
A. D. Hoch
T. R. Reinhart

Massachusetts Institute of Technology
Cambridge, Mass.

**Developments in ceramic tooling are progressing at such a rapid pace that application potentials should be analyzed. This discussion evaluates the present status of American ceramics and gives some practical suggestions on how to best use them with present machine tools.**

INTRODUCTION OF CERAMICS for use as cutting tools has opened new horizons in metalworking but has also presented new problems. A series of tests, *Fig.* 1, are being conducted in the machine-tool laboratory, to find some of the answers.

One of the first questions involve the form in which ceramic tools may be most effectively used. In arriving at an answer it is helpful to consider briefly the stages of development through which tool materials have passed.

*Senior member ASTE Boston chapter.

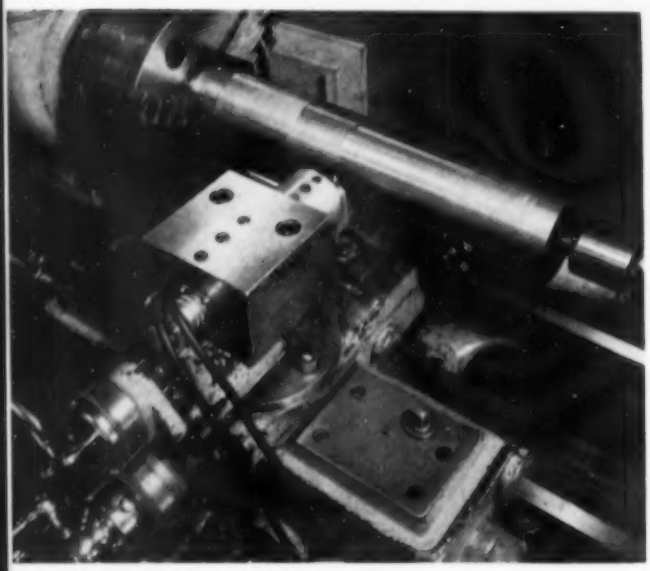
Before 1900, tools were made from relatively inexpensive oil-hardening steel and cutting speeds were low. Introduction of the more expensive high-speed steels presented certain problems. The massive forged-tool construction then in use, *Fig.* 2*a*, was unsatisfactory for high-speed steels. Machine tools lacked the power and speed to take full advantage of the new materials. New machines were introduced within a few years and the tool form was slowly changed to the smaller rectangular shape, *Fig.* 2*b*, that is still widely used for high-speed steel tools. The adoption of cast-alloy (Stellite) tools in the 1920's, of cemented-carbide tools for cast iron in the 1930's, and of cemented carbide for cutting steel in the 1940's posed similar problems. Each improvement in tool material was accompanied by an increase in hardness, brittleness and cost, but made it possible to work at higher cutting speeds.

Because of the relatively high cost of cemented carbide, it became necessary to use tool tips that were brazed to a steel shank, *Fig.* 2*c*. At first, these tips were relatively thick, but as it was learned how to use such tools more effectively and as they became less brittle due to improved manufacturing methods, it became possible to decrease the thickness of the cemented carbide tip.

About 1950, the clamped-carbide tip, *Fig.* 2*d*, was developed to avoid residual stresses, introduced during brazing, and thermal stresses arising from the different expansion coefficients of the carbide tip and the steel shank. It was quickly realized that several edges of a clamped element could be utilized and tools of the type shown in *Fig.* 2*e*, appeared about 1952. The throw-away idea was a

natural extension of these developments. Today the most advanced carbide turning-tool designs, *Fig. 2f*, use multiple-point tool tips, which contain such a small amount of tungsten carbide that it is impractical to regrind them. It is actually more economical to throw the tips away after all edges are worn out.

Each of these changes required new thinking and basic changes in tool use policy. In fact, some developments, even in the field of carbide tooling, are so new that tool engineers have scarcely had an opportunity to take full advantage of them.



For example, cemented-carbide tools are considered to be worn out and ready for regrinding when a wear land of 0.030 inch has developed on the clearance face. The present American standard for tool wear defines tool life in this way. This criterion for tool life is well founded for the average brazed-carbide tool, when the cost of diamond grinding is taken into consideration. However, a throw-away tool should generally be used to a point just short of total destruction, regardless of the size of the wear land.

Adoption of the throw-away tool principle makes it necessary to give more attention to tool life. In this connection, the work of Weber[1], which discusses the relationship between tool life defined in terms of a constant wear land and tool life in terms of total destruction, is particularly timely.

Development of ceramic-tool materials represents the latest addition to the historic series: carbon steel, high-speed, cast-alloy materials, sintered tungsten carbides, sintered mixed carbides, sintered aluminum-oxide-base materials. In each case the new material has been more refractory, permit-

[1]References are tabulated at end of article.

**Fig. 1. Setup for comparative testing of ceramic and carbide cutting tools.**

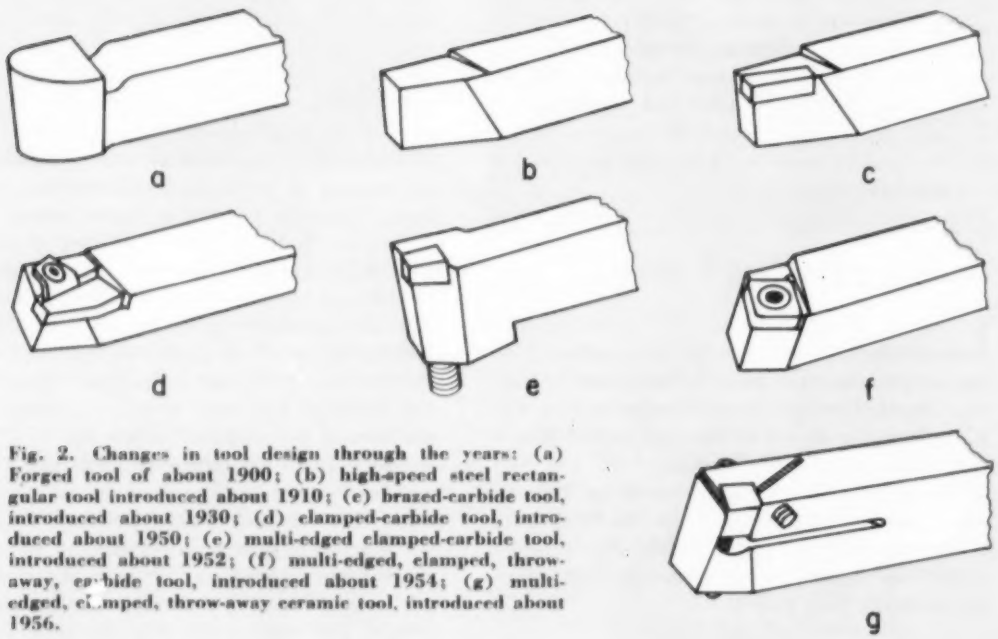



**Fig. 2. Changes in tool design through the years: (a) Forged tool of about 1900; (b) high-speed steel rectangular tool introduced about 1910; (c) brazed-carbide tool, introduced about 1930; (d) clamped-carbide tool, introduced about 1950; (e) multi-edged clamped-carbide tool, introduced about 1952; (f) multi-edged, clamped, throw-away, carbide tool, introduced about 1954; (g) multi-edged, clamped, throw-away ceramic tool, introduced about 1956.**

ting higher cutting speeds, but more brittle. Ceramic tools are no exception. While the cost of each new material introduced in the past has increased, ceramic-tool materials are potentially less expensive.

These tools are not only potentially less expensive to manufacture, but utilize abundant noncritical raw materials. Because of this reversal in the trend of increasing tool-material cost, the first ceramic tools introduced in Germany during World War II had the same shape as high-speed steel tools. This form was found unsuitable due to brittleness of ceramic tools and their tendency to fracture when used in massive sections. When interest in ceramic tools was revived in the 1950's, the first tools tried were either brazed or cemented to a steel holder.

Brazing stresses that are troublesome with less brittle carbides gave too much difficulty with ceramics, however, and this method of fastening quickly gave way to a clamped tool-tip construction. The lower potential cost of ceramic tool tips makes it economically feasible to provide throw-away tools of thicker section than in the case of cemented carbides. This change to thicker section tends to offset the greater brittleness of ceramic.

It is predicted that in the future ceramic tools will find their greatest application in the form of relatively thick—3/8 inch or more—throw-away tips having several cutting edges per tip. Wherever possible, such tools should be used just short of total destruction rather than to a given wear land.

In the tests to be described, throw-away carbide tools of the type shown in *Fig.* 2*g*, were tested to total destruction.

**Nomenclature**

$\phi$ = Cost to machine one part, cents

$\phi_a$ = Cost per part using ceramic tool *A*, cents

$\phi_a'$ = Cost per part using ceramic tool *A* at optimum conditions, cents (ditto B & E)

$\phi_b$ = Cost per part using ceramic tool *B*, cents

$\phi_c$ = Cost per part using carbide tool *E*, cents

$K$ = Constant depending on conditions

$n$ = Constant, slope of cutting speed, tool life on log-log paper

$n'$ = Value of $n$ at the point $T'$, $V'$

$R$ = Cost factor, minutes

$T$ = Tool life, minutes

$T_c$ = Cutting time per part, minutes

$T_d$ = Down time for tool change, minutes

$T'$ = Tool life, minutes, corresponding to minimum cost per part

$T_c'$ = Time to make cut, minutes, at minimum part cost (optimum speed $V'$ and tool life $T'$)

$V$ = cutting speed, fpm

$V'$ = Cutting speed for minimum cost per part, fpm

$W$ = Wear land, inches

$x$ = Value of machine, labor and overhead, cents per minute

$y$ = Mean value of one cutting edge, cents

## Basic Types of Ceramic

The Russian literature[2] reveals that two materials of many that have been developed have been adopted as standard. These are referred to as "Thermokorund" and "Microlit." Both of these materials are basically pure sintered-aluminum oxide but Microlit has a higher hardness than Thermokorund. This is apparently due to a difference in sintering procedure and temperature. Specific gravity of the harder material is also considerably higher than that of the softer material. The harder material, Microlit, permits higher cutting speeds to be used. Apparently on the basis of this the most recent Russian literature fails to mention Thermokorund, indicating perhaps, that interest in this material has waned.

Two similar types of products have been developed more recently in the USA, and each is made by more than one company. One type of material has a hardness of about 86 Rockwell *A* and a specific gravity of about 3.75. This material will be referred to as ceramic *A*. The second variety of sintered aluminum oxide, which will be referred to as ceramic *B*, has a specific gravity close to that of a perfect crystal (=3.99) and its hardness is about $R_a$ 92.

When tested, the performance of the soft *A* material shows closer similarity to carbide, while the hard *B* material allows much higher cutting speeds for the same tool life. Ceramic *A* would be of little interest except for the fact that it costs considerably less to produce than ceramic *B*. Ceramic *A* is cold pressed in carbide dies, is sintered at a lower temperature than ceramic *B* and is not ground after sintering. Ceramic *B*, on the other hand, is hot pressed in a graphite die, is sintered at high temperature and is finished all over by diamond grinding. The cost of ceramic *B* is about the same as the cost of an identical sintered-carbide tool.

Questions that naturally arise in connection with these materials are the following:

1. Is the softer, less expensive material of any interest?
2. If so, when should it be used?
3. How do the soft and hard types of ceramic compare

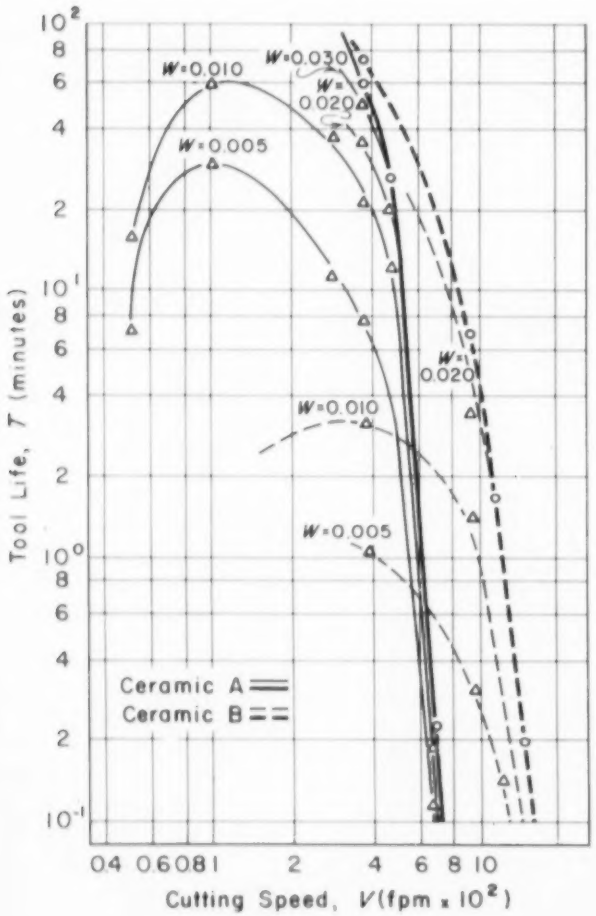
**Table 1—Description of Cutting Tools and Test Conditions**

| | |
|---|---|
| **Tool Angles:** | |
| Back-rake angle, deg | -7 |
| Side-rake angle, deg | -7 |
| End-relief angle, deg | 7 |
| Side-relief angle, deg | 7 |
| End-cutting-edge angle, deg | 15 |
| Side-cutting-edge angle, deg | 15 |
| Nose radius, inch | 1/32 |
| **Cutting Conditions:** | |
| Work material, annealed AISI 4340 steel, Brinell | 185 |
| Work diameter, inches | 2¼ to 6¾ |
| Work length, inches | 22 |
| Feed, ipr | 0.011 |
| Depth of cut, inch | 0.100 |
| Cutting speed | variable |
| Cutting fluid | none |

with cemented carbide?

4. On what basis should the comparisons be made?

To provide answers to these questions, tests were performed on rectangular ceramic types *A* and *B*, and carbide tools, Grade C-5 of the throw-away type tool *E*. All measured ⅜ x ⅜ x ½ inch. These tools were clamped in a holder of the type shown in *Fig.* 2*g*, which provided the tool angles given in TABLE 1.




## Comparative Test Results

All tests were to total destruction of the tools. Wear land on the clearance face in the vicinity of the middle of the depth of cut was measured at the end of each pass. A 10-hp engine lathe equipped with a d-c motor was used in these tests. Speed was carefully adjusted to the desired value with each change of diameter and after each cut was under way.

The Taylor plots for the two ceramic materials are shown in *Fig.* 3. The heavy lines are for total destruction while the lighter lines are for the values of wear land ($W$) on the clearance face indicated. It is clearly evident that ceramic *B* gives superior results to ceramic *A* at high values of cutting speed but poorer results than ceramic *A* at speeds below about 300 fpm.

The Taylor plots for total destruction for all three materials are presented in *Fig.* 4. The ceramic tools have tool-life curves of much steeper slopes than the curve for the carbide tool at high speeds but lesser slopes at lower speeds. The Taylor equation is:

$$V T^n = K \quad \ldots\ldots (1)$$

While this equation applies to carbides over a wide range of speeds, it may be considered to hold for the ceramic tools only over a narrow range of speed for given values of the constants, due to nonlinearity of these curves. Considering the last of the four questions previously posed, it is immediately evident that the comparison should be made of the total cost to machine a part rather than in terms of tool life alone.

## Cost Considerations

The total cost ¢ of machining a part consists of the value of labor and machine along with overhead, and the tool and tool-changing costs. Using the definitions given in the nomenclature this can be expressed as follows:

$$¢ = xT_c + (xT_d + y)\frac{T_c}{T} \quad \ldots\ldots (2)$$

The cost per part will be a minimum at a certain tool life[3], which is when:

$$T^n = \left(\frac{xT_d + y}{x}\right)\left(\frac{1}{n} - 1\right) = R\left(\frac{1}{n} - 1\right) \ldots (3)$$

**Fig. 3. Comparison of tool life test results for ceramics *A* and *B* when tested under the conditions of Table 1. The numbers given refer to values of wear land ($W$) in inch.**

For sintered-carbide tools the slope of curve, $n$, is 0.25. For this case Equation 3 becomes:

$$T' = 3R$$

Values of $T'$ corresponding to different values of $R$ are given in *Fig.* 4, by the scale of $R$ values. Corresponding values may be similarly found for the ceramic tools but, due to the curvature of their Taylor plots, values of $n$ corresponding to the slope at each point must be used. The spread between $R = 1$ and $R = 10$ is reduced by the curvature of the Taylor plots.

The values of $R$ for the ceramic and carbide tools of this investigation may be estimated as follows:

For ceramic tool *A*, the value of machine, labor and overhead is 12 cents per minute or $7.20 per hour. The value of 1 cutting edge is 12 cents; total cost of tool having 8 edges = $1. Mean time to change cutting edge ($T_d$) = ½ minute. Therefore,

$$R = \frac{xT_d + y}{x} = 1.5 \text{ minutes.}$$

For ceramic tool *B* and the carbide tool, the value of machine, labor and overhead is 12 cents per minute or $7.20 per hour. Value of 1 cutting edge is 62 cents; total cost of tool having 8 edges is $5. Mean time to change cutting edge ($T_d$) = ½ minute. Therefore,

$$R = \frac{12\ (\tfrac{1}{2}) + 62}{12} = 5.7 \text{ minutes.}$$

These values of $R$ are indicated by the points marked *Z* on the respective plots of *Fig.* 4.

From Equations 2 and 3 the minimum cost per part will be:

$$\phi' = \frac{xT_c'}{1 - n'} \quad \ldots\ldots(4)$$

For a given feed and work diameter,

$$T_c' = \frac{1}{V'} \quad \ldots\ldots(5)$$

Combining Equations 4 and 5,

$$\phi' = \frac{x}{V'(1 - n')} \quad \ldots\ldots(6)$$

As previously mentioned, the best way of comparing two tools that give different values of tool life and have different costs is not in terms of tool life alone, but in terms of minimum cost per part. By means of this expression it is possible to set up a proportion to make such a comparison for the data of these tests. The values from Fig. 4 are given in TABLE 2. Using these data the following ratios are secured:

$$\frac{\phi_a'}{\phi_e'} = 0.97$$

$$\frac{\phi_b'}{\phi_e'} = 0.79$$

This shows that if ceramic *B* can be operated at 770 fpm with a tool life of 15 minutes, the saving in total machining cost per part will be 21 percent based on the machining cost with carbide. However, when ceramic *A* is operated at the optimum speed of 500 fpm to give a tool life of 16 minutes, it will yield a total cost per part that is practically the same as that for the cemented carbide. It is evident that, in this example, the much greater cost of ceramic *B* is more than justified provided the lathe has sufficient speed and power capacity to make the required cut.

**Table 2—Comparison of Test Data**
(taken from *Fig.* 4)

| Tool Material | $n'$ | $T'$ (min.) | $V'$ (fpm) |
|---|---|---|---|
| Ceramic *A* | 0.10 | 16 | 580 |
| Ceramic *B* | 0.28 | 15 | 770 |
| Carbide *E* | 0.25 | 17.5 | 580 |

**Table 3—Values of Tool Life**
(from tests shown in *Fig.* 4)

| Tool Material | Tool Life, $T$ (min.) $V$ = 400 fpm | $V$ = 500 fpm | $R$ |
|---|---|---|---|
| Ceramic *A* | 52 | 22 | 1.5 |
| Ceramic *B* | 70 | 46 | 5.7 |
| Carbide *E* | 85 | 31 | 5.7 |

## Machine-Tool Limitations

For a one-inch AISI steel workpiece the required speed and power at the tool point correspond to 2950 rpm and 10 hp for the 0.011 by 0.100-inch cut. There are no lathes commercially available today which meet these requirements, and so the full potential of ceramic *B* could not be utilized. Lathes for this class of work have a top speed of from 1500 to 2000 rpm and from 5 to 10 hp available at the cutting edge. This means that, for the steel and cut considered in the foregoing example, the speed will be limited to from 400 to 500 fpm when cutting a one-inch bar. Values of tool life from *Fig.* 4 are given in TABLE 3 for speeds of 400 and 500 fpm.

From Equation 2 the cost per part may be written:

$$\phi = xT_c\left(1 + \frac{R}{T}\right) \quad \ldots\ldots(7)$$

for a part of given diameter machined on a given lathe at fixed feed. This may in turn be written:

$$\phi = 1 + \frac{R}{T} \quad \ldots\ldots(8)$$

Thus comparisons of machining cost per part may

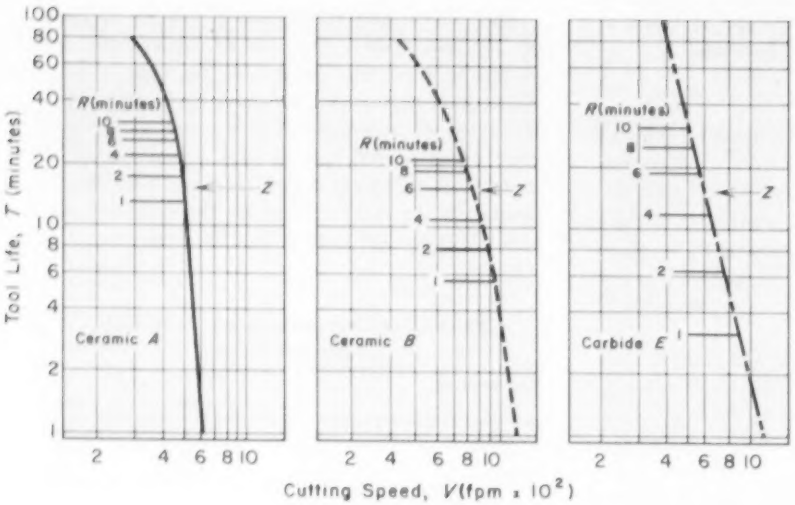



**Fig. 4. Variation of tool life (total destruction) with cutting speed for ceramics *A* and *B* and carbide *E* when tested under the conditions of Table 1. The points marked *Z* indicate the conditions for minimum production costs.**

**Table 4—Comparison of Machining Cost per Part of Ceramic and Carbide Tools**

(from test data in *Fig.* 4)

| Materials Compared | Cost Ratios $V = 400$ fpm | $V = 500$ fpm |
|---|---|---|
| $\frac{c_A}{c_E}$ | 0.96 | 0.90 |
| $\frac{c_B}{c_E}$ | 1.01 | 0.95 |

be made at limited cutting speeds, such as 400 or 500 fpm. Making these comparisons, using the data given in TABLE 3, results in the cost ratios shown in TABLE 4.

It is apparent from this analysis that if the capacity of an existing machine tool makes it impossible to machine with speed and power beyond those that should now be used for the best carbide tools, then ceramic tool material *A* is economically more attractive than material *B*.

As machine tools of greater capacity are developed, or if the price of ceramic *B* can be reduced relative to ceramic *A*, then the harder ceramic can replace the softer variety in its position of relative importance. The ceramic tools appear to be economically more attractive than cemented carbide tools at intermediate and high cutting speeds. It is important, however, to avoid using ceramic tools at low cutting speeds.

## Brittle Behavior of Ceramic Tools

It is well known that a high-speed steel tool will have a greater tool life than a cemented carbide tool at speeds of 50 fpm or lower. Carbide tools should normally not be used below 100 fpm. The reason is that carbide is more brittle than high-speed steel and brittleness is a property that increases with decrease in temperature, i.e., cutting speed. Similarly, ceramic material type *A* should not be used below a speed of about 200 fpm. and ceramic material of type *B* below a speed of about 300 fpm.

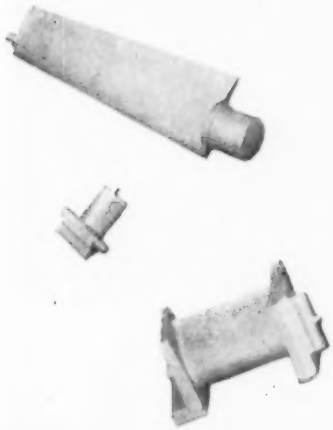
If it appears desirable to try a ceramic tool on a job for which the cutting speed is 300 fpm or less, type *A* ceramic should be preferable to a type *B* since it will inherently less brittle. This point is illustrated by the fact that the total destruction curves of *Fig.* 3 cross at a speed of about 330 fpm.

The brittle character of ceramics and the beneficial influence of increased temperature upon the brittle behavior of such materials give rise to a paradox. While at first it might be thought that a ceramic tool would operate best when cutting relatively soft materials, such as mild steel rather than hardened steels too difficult for cemented carbide tools, this does not appear to be the case. The smaller tendency for welds to form between chip and tool when the hard material is cut, together with the higher operating tool-tip temperatures of the harder material, gives rise to a lesser rather than a greater tendency for brittle behavior. Use of ceramic tools in machining hard materials under finishing conditions should not, therefore, be too hastily dismissed as being impractical.

### References

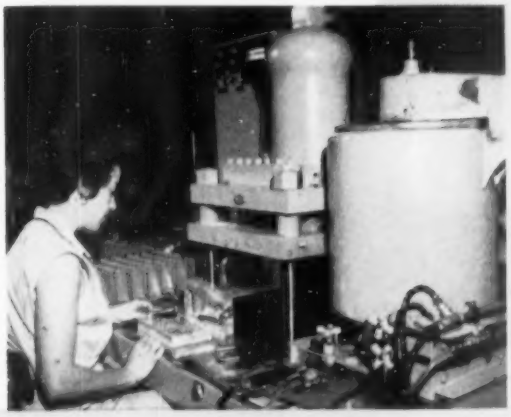
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Spanentstehung und Standzeitverhalten bein Drehen von Stahl mit Hartmetall"—G. Weber, Sonderteil des Industrie-Anzeigers; *Werkzeugmaschine und Fertigungstechnik*, Juni 1955, S. 619.
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# TOOLS at work



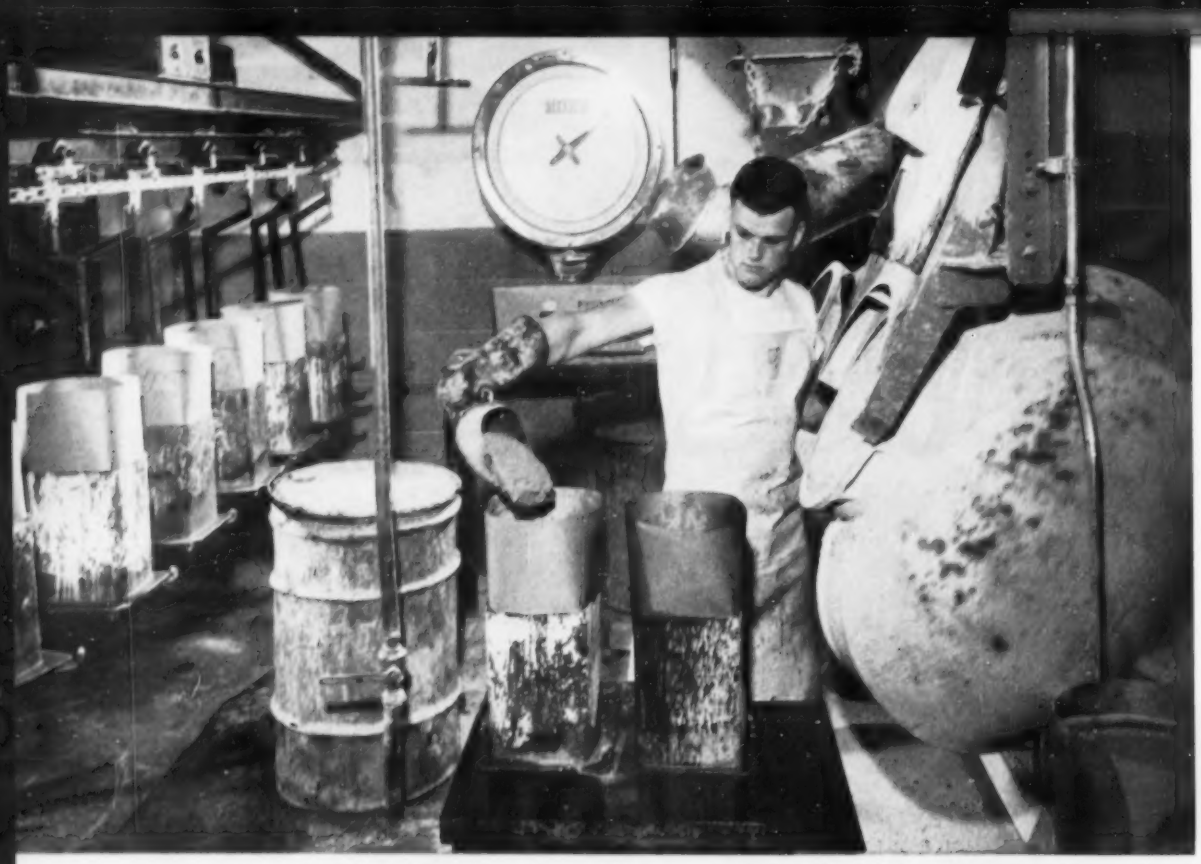
## Advances in Investment Casting

WITH THE ADVENT OF JET AIRCRAFT, which requires many precision castings of refractory materials, the investment casting industry has expanded. Sharing in this growth, Misco Precision Casting Co. has opened a new facility in Muskegon, Mich. The new foundry is equipped with the latest production and inspection equipment for the manufacture of castings of high-temperature alloys. Some of the operations from this and the company's Whitehall plant are shown in the accompanying illustrations.

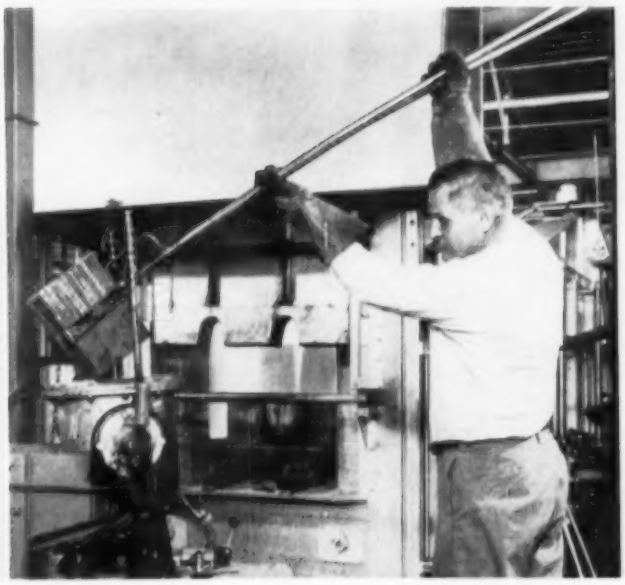


FIRST STEP in the production of investment castings is preparation of patterns. The complete injection cycle is automatic. Injection pressure, clamping pressure and wax temperature are varied to suit the job. Operator places die in machine, trips button, and withdraws die from machine after completion of cycle. The delicate wax patterns are then manually removed from die. Individual patterns are subsequently assembled to permit pouring a group of castings at one time.



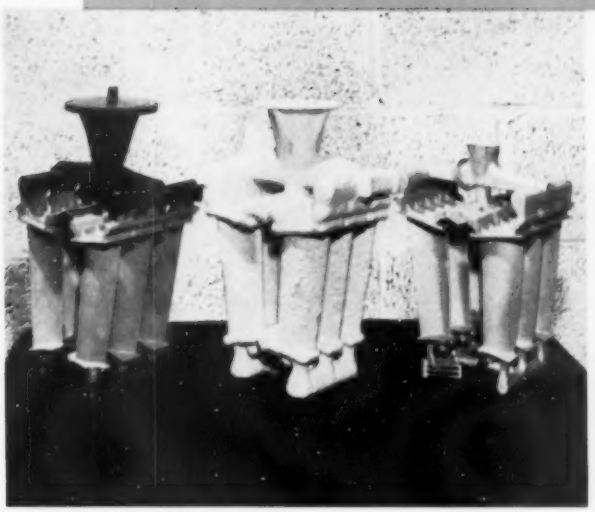


WAX PATTERNS are dipped in silica slurry. This primary investment envelops the cluster in a ceramic shell, giving a smooth finish to the casting. After dipping, the cluster is stuccoed with coarse sand to facilitate adhesion of the dip coating with the second investment and is mounted in a high-alloy steel flask lined with water-resistant paper. Molds are then filled with the secondary investment material consisting of sand, fire clay, silica flour and magnesium oxide with hydrolized ethyl silicate binder. During filling the flasks are mounted on a vibrating table to insure good packing. The material gels to a monolithic mold. Molds are cured in a continuous preheat furnace for 12 to 16 hours at 1600 to 1900 F, burning out the wax patterns and raising molds to the proper temperature to receive metal.



MOLDS go from the preheat furnace to the casting furnace area. Indirect-arc electric furnaces contain sufficient molten metal to fill one mold. Radiamatic electronic instruments check furnace temperature. When the molten metal reaches correct temperature, a mold is clamped on, the furnace is inverted and the metal flows into the cavity of the mold. Rate of roll-over is critical and air pressure is introduced behind the metal to assure proper filling. Furnaces are charged with metal in the form of prealloyed shot, making it possible to weigh out the exact amount of metal required for the casting. After the casting has solidified, it is shaken out of the flask by a pneumatic vibrator.

# TOOLS at work



MONO-SHELL PROCESS, newly developed, uses a ceramic shell as a mold cavity, replacing the massive investment mold. Material requirements are reduced and shorter time cycles are required for removing the wax and preheating the molds. Better refractory properties of the material also permit higher pouring temperatures. Cluster of wax patterns appears at left; mold at center and completed casting at right of the above photograph.

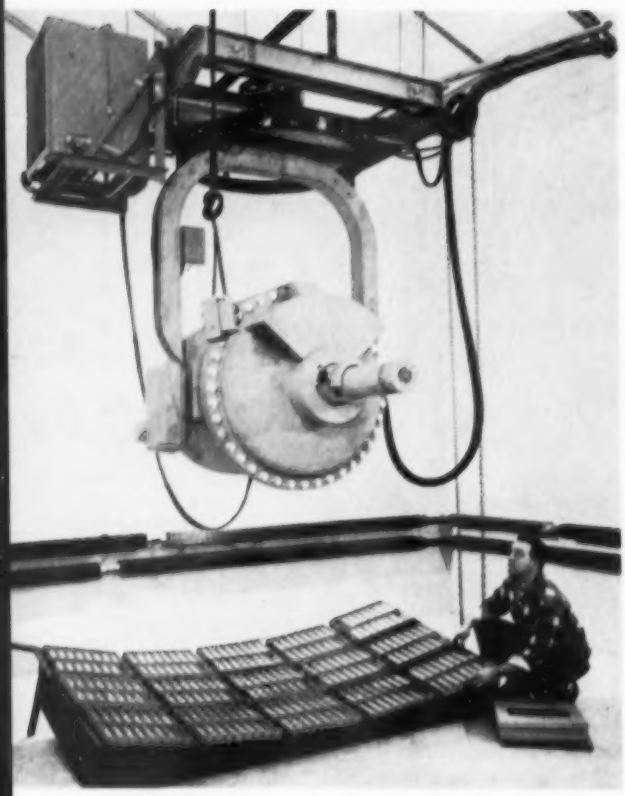


WITH THE MONO-SHELL PROCESS, molds are strong enough after firing to be handled by tongs and clamped to melting furnaces in the same manner as conventional molds. Operator is tilting the electric furnace preparatory to filling mold with molten metal. Light weight of the ceramic shells greatly facilitates handling.

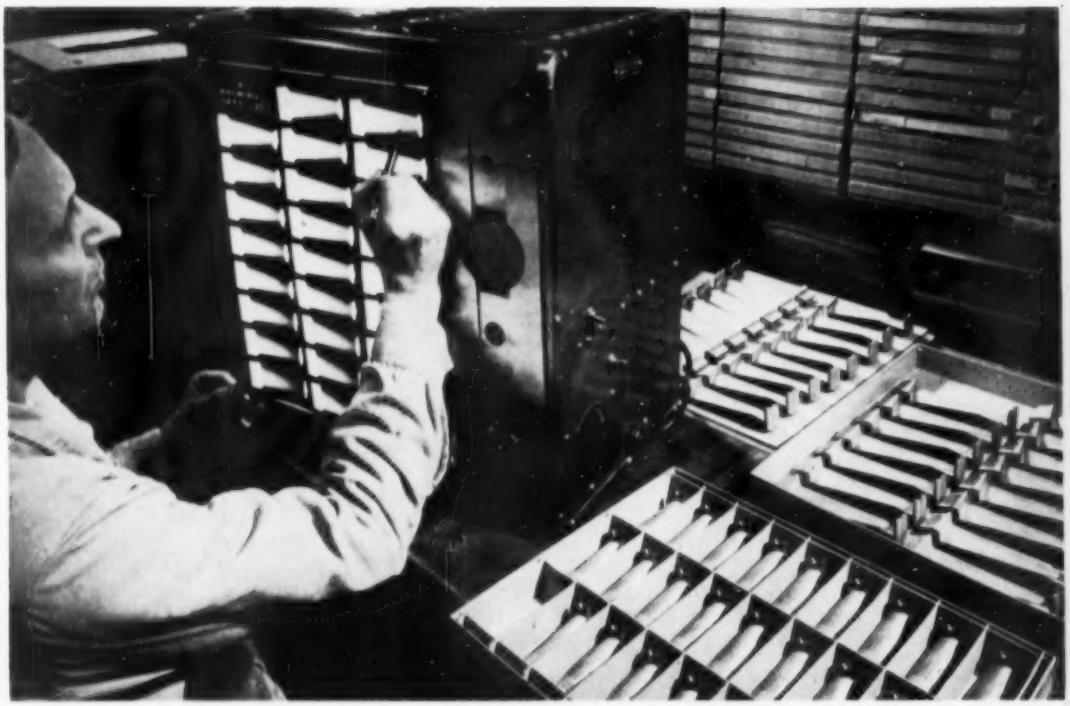


IN MAKING A MOLD by the Mono-Shell process, wax patterns are dipped in a refractory slurry, then stuccoed with a fine powder. A number of coatings are built up to produce the completed mold. When coating operations have been completed, the mold is fired to remove wax pattern.

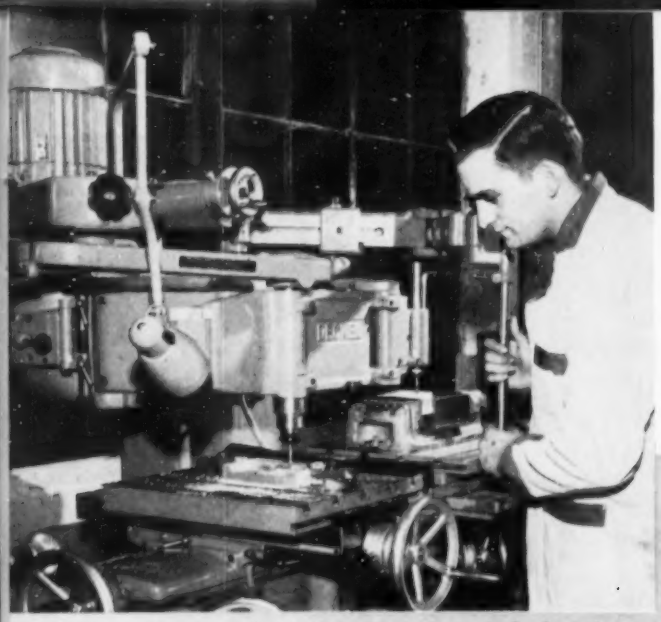
# TOOLS at work



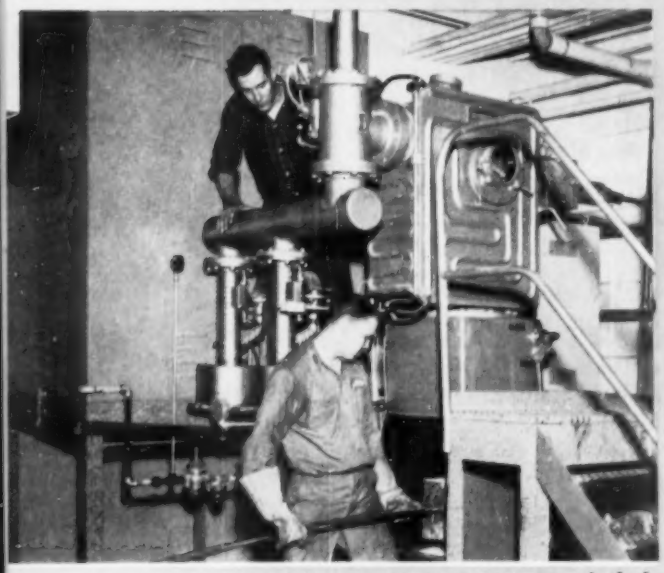
MILLION-VOLT X-RAY UNIT makes radiographs of heavy sections to detect minor defects which could not be found with lower-voltage equipment. Cardboard boxes of turbine blades are positioned under X-ray machine. Sensitized film is placed under each box. This X-ray inspection is performed on all turbine blades.



RADIOGRAPHER reads the X-ray film of turbine blades. Because the castings are X-rayed in partitioned boxes, defective parts are easily located by referring to the film. Rejects are removed and correlated film and castings are shipped in the same box, giving the user an opportunity to double-check for defects.



DECKEL MILLING MACHINE is typical of equipment required to produce accurate master patterns and dies. Airfoil contours of a turbine blade are duplicated in making a die for production of wax patterns. Die will be polished to generate required smooth surface finish. By careful die work, accuracy of finished castings is held within ± 0.005 per linear inch.



NEW HIGH-TEMPERATURE MATERIALS, particularly nickel-base alloys, are highly reactive and must be poured in a vacuum. Vacuum furnace shown is of the continuous casting type. Metal is charged and molds cast without breaking the vacuum in the furnace compartment.



AFTER MACHINING AND POLISHING, mold (foreground) is checked against master pattern, held in sine plate (center). An allowance is made in the mold for shrinkage of molten metal. A wax pattern appears in left foreground.

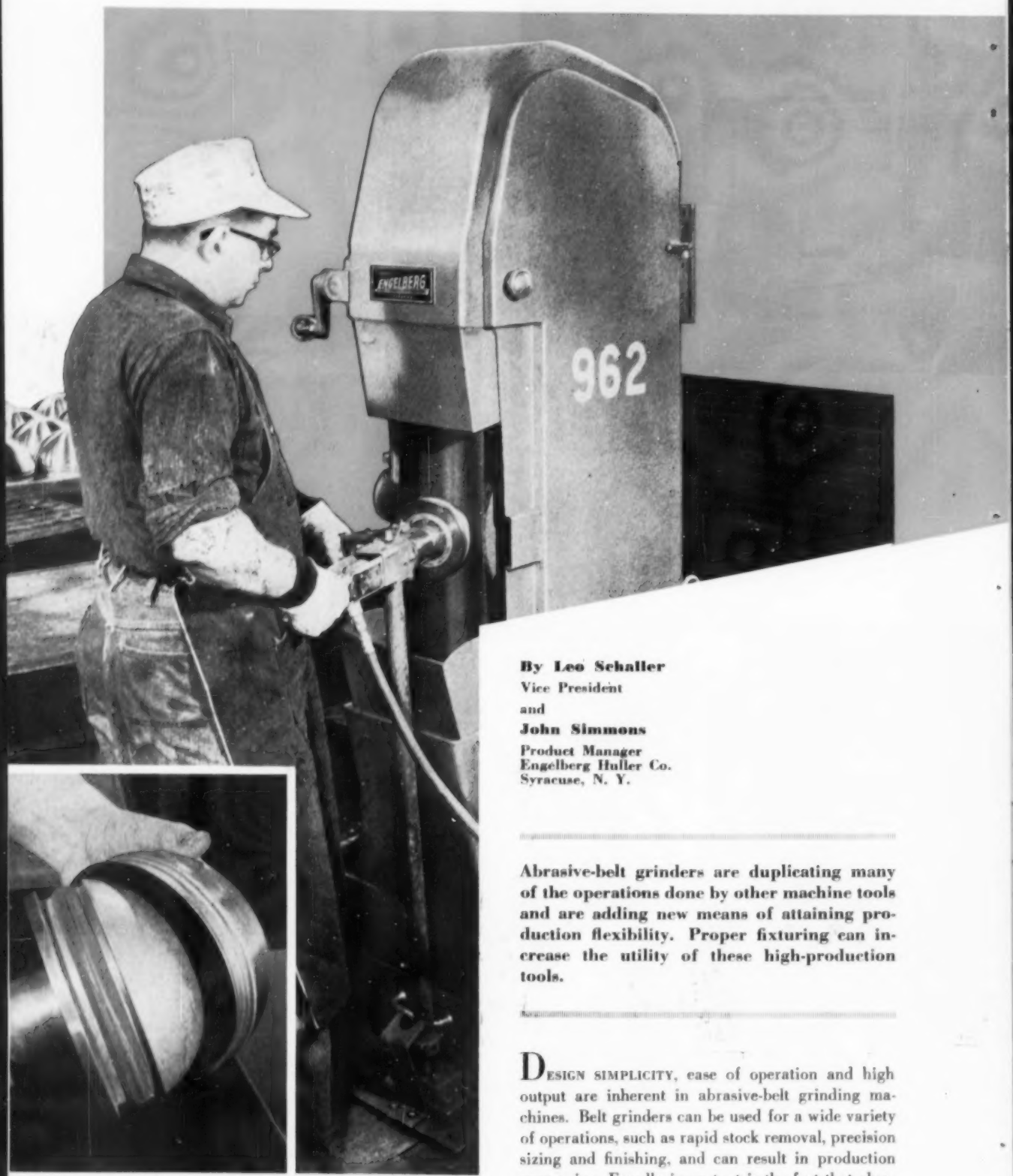



Fig. 1. Setup for belt grinding automobile foglight shells prior to plating. Inset shows easy-loading inflated-gasket work chuck.

**By Leo Schaller**
Vice President
and
**John Simmons**
Product Manager
Engelberg Huller Co.
Syracuse, N. Y.

**Abrasive-belt grinders are duplicating many of the operations done by other machine tools and are adding new means of attaining production flexibility. Proper fixturing can increase the utility of these high-production tools.**

DESIGN SIMPLICITY, ease of operation and high output are inherent in abrasive-belt grinding machines. Belt grinders can be used for a wide variety of operations, such as rapid stock removal, precision sizing and finishing, and can result in production economies. Equally important is the fact that abrasive-belt grinders can be tailored to finish specific parts through imaginative use of fixtures, further

# Abrasive-Belt Grinding ...fixtures speed production and cut costs

exploiting the basic advantages of belt grinding.

Despite the unlimited diversity of workpieces, fixtures and machine-operation combinations, there are certain general rules that apply in most belt-grinding operations. The specific examples in this article have been selected to point up these generalizations and underscore the importance of proper fixturing.

**Use Full Belt Width:** If practical, the longest dimension of a workpiece should be presented across the belt. This minimizes the distance the belt must carry chips over the work and permits maximum effectiveness of the coolant.

Machine table oscillation devices, which carry the workpiece back and forth across the face of the abrasive belt insure even distribution of belt wear and minimize belt costs. Where the workpiece is kept in motion, the belt is more easily flushed by the coolant and heat dissipation is speeded.

**Design for Easy Loading:** Since most abrasive-belt operations are fast—seldom requiring more than 30 seconds net grinding time—nongrinding time in a finishing cycle is more important. Fixtures should be designed so the operator can match the production potential of the machine. Lightweight work-holding devices are usually sufficient because abrasive belts cut with little pressure. Less pressure is required, for example, than when milling or disk grinding. Another advantage of this low cutting pressure is that internal strains are not set up in the workpiece. Such strains are seldom encountered, even with thin-walled castings. Parts can frequently be held in position with a small permanent magnet on the work-supporting plate, eliminating the need for clamps or bolts.

The value of fast loading and unloading can be illustrated by the preparation of automobile foglight bodies before nickel and chrome plating. The R. E. Dietz Co. uses belt grinding to remove draw marks and sunbursts from the deep-drawn steel shells at a rate of 160 per hour. This production rate is possible because of good fixturing used with a formed-wheel grinder, *Fig.* 1. Shaped like a bowl, the fixture is mounted on a swivel pole with a ball-joint base.

An inflated rubber gasket on the work chuck, with approximately 15 psi air pressure, holds the foglight bodies during grinding. To load or unload the chuck, the operator depresses a foot pedal that cuts off the air supply and deflates the gasket. A brake control regulates the turning speed of the part, which is rotated by the belt action. The flexible belt is backed by a resilient wheel, whose concave surface conforms to the shape of the steel shell.

A motorized rotary chuck, *Fig.* 2, is used for surfacing power-belt contact faces of variable-pitch pulleys at Sterling Electric Motors. This example also points up the high production rates resulting from fast-loading fixtures. Two requirements—surface uniformity over the entire contact face of the power-belt pulleys and identical quality—are major factors in achieving long power-belt life and top performance for variable-speed drives. A platen type belt grinder, with hydraulic infeed table, provides a consistent 32-microinch, rms, finish with a stock

removal of about 0.010 inch. The table is equipped with a cam-actuated oscillating device. Abrasive belt life ranges from 300 to 350 pulleys per belt.

**Multiple Loading:** When fixtures can be designed for continuous operation, considerable production time can be saved. A good example of this is illustrated by a "merry-go-round" track, *Fig.* 3, used in polishing stainless-steel knife handles. The unit comprises 21 molded-plastic fixture plates that revolve continuously on parallel roller chains. Production rate is in excess of 2100 parts per hour.

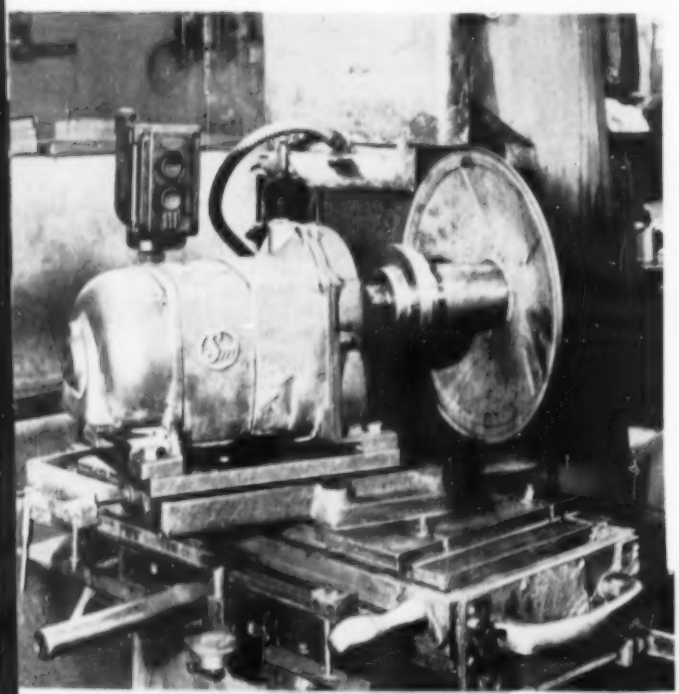
Knife handles are manually loaded in the fixture plates and are automatically ejected after finishing. As each fixture plate passes over the leading edge of the abrasive belt, it rides on hardened shoes over hardened-steel rails and is advanced quickly into the belt surface. The work automatically feeds in at an adjustable rate during its passage across the belt, and is retracted quickly before it leaves the belt's farther edge. This operation results in a straight-line accuracy of ± 0.0005 inch.

Recent introduction of multiple-head, conveyor type abrasive-belt machines has increased the production potentials of multiple-part feeds. A two-head belt grind, *Fig.* 4, equipped with a specially molded 7 by 144-inch conveyor belt, has led to a tenfold production increase in processing brass escutcheon plates at Adams-Rite Mfg. Co. Previously parts were manually roughed on a backstand idler, semifinished on a buffing wheel and then color buffed at a rate of 310 parts per hour. The conveyor-feed grinder combines two operations in a single cycle, avoids need for color buffing and raises production to 3600 parts per hour.

On another application at Adams-Rite—sizing and finishing aircraft lock parts—the production potential of 6900 parts an hour is so high that the operator has difficulty in loading the molded conveyor belt. The company is planning to devise an automatic loader.

A new two-level adaptation of this multiple-head model, using a turn-over hopper unit and two conveyor belts, makes possible single-cycle belt grinding of both sides of flat parts. Conveyorized parts pass under the upper-level grinding head, and are turned over in the gravity-feed hopper, carried under the lower grinding head and automatically ejected when finished.

**Multisize Fixtures:** If several sizes of the same part have one or more locating features in common,



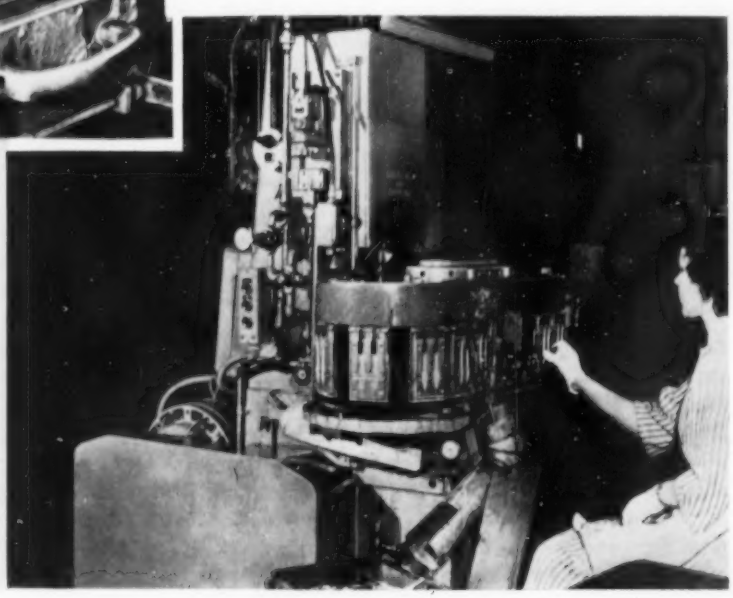


**Fig. 2. (above) A motorized work chuck rotates variable-pitch pulleys as their contact faces are fed against the abrasive belt. The operator loads and unloads parts but, since grinding operations are automatic, has time to operate a lathe and broaching machine as well.**

**Fig. 3. (right) Continuous-feed device carries stainless-steel knife handles across the face of an abrasive belt. Handles are removed by solenoid-operated ejectors.**

a single fixture can frequently be designed to accommodate all of them for belt finishing. Often, a slight design modification in the parts can make this possible. Such a setup pays dividends in increased production, short-run flexibility and minimum setup time.

At Graymills Corp., for example, the complicated shape of volute castings used in immersion type pumps, presented a machining and resultant high-reject problem. A protruding hub on the gray-iron castings rendered the parts unsuitable for turning on a lathe or for surface milling since the overhang caused deflection and distortion during machining. With the installation of a platen type belt grinder and the use of a draw-bar pneumatic fixture, *Fig.* 5, the problem was neatly solved. Since the diameter of the center hole was constant throughout the size range, the company uses the same fixture for four sizes and for two operations. First, the volute legs are finished and then the part is reversed so the sealing face can be belt ground.

The air fixture's shaft extends through both an angle bracket and the volute center. A C-washer locks the volute in position and a pneumatic holding pressure of 100 psi securely anchors the casting during the grinding cycle. Because the same fixture handles several different volute sizes, setup time is appreciably reduced over prior methods. Despite stock removal of $\frac{1}{32}$ inch, the belt grinder, which is equipped with an automatic infeed table and an air-oscillating device, maintains a reject-free production rate of one casting per minute on first operation and one every $1\frac{1}{2}$ minutes on second operation.

A cylindrical-grinding fixture, *Fig.* 6, is used by Olsen Machine and Tool Co. for multiple, concentric grinding of shaded-pole rotors for electric motors. The motorized wheel head, fitted with three 6-inch rubber wheels, is mounted on the machine table of a platen type belt grinder.

Rotors are loaded in gangs—as many as 12 per gang, depending on width—on a hardened-steel arbor, which is in turn inserted in the carbide-lined V-blocks of the work-holding form. The machine produces to concentricity of 0.0002 inch and diameter tolerances of ± 0.0005 inch. The complete cycle—loading, grinding and unloading—requires about 12 seconds. On smaller-size rotors, production rates can exceed 2000 per hour.

The two center V-block uprights in the work-holding form are removable to accommodate large-size rotors. Interchangeable gears can be quickly inserted to change the speed of the regulating wheels for different diameters. This installation, adaptable in principle to other cylindrical grinding requirements on small parts, emphasizes the role of fixturing in increasing the application range of surface type belt grinders.

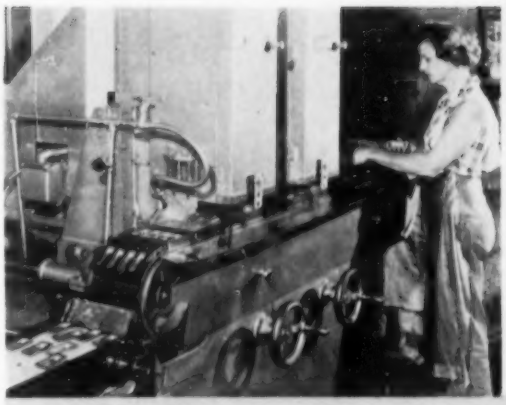
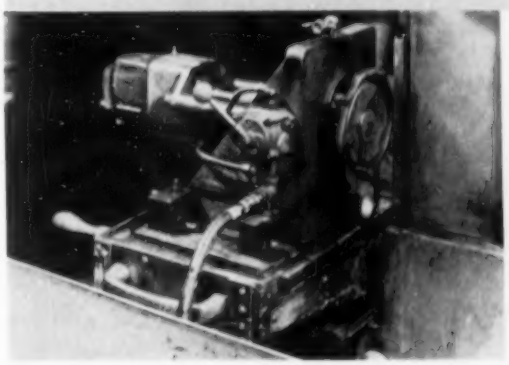


**Fig. 4. Conveyor belt is molded with pockets to hold escutcheon plates as they pass under twin heads for roughing and finishing.**

**Fig. 5. (below) Draw-bar fixture holds pump volute castings of various sizes so they can be belt-ground. Seal surface must be flat enough to hold a fluid pressure of 40 psi when gasketed with its mating surface.**



**Combination Operations:** It is frequently possible to design belt-grinder fixtures that can handle more than one operation. In addition to the previously mentioned examples, this concept is illustrated by a fixture, *Fig.* 7, used at General Electric to grind spacers for gas-turbine compressor blades. This one can hold a spacer for three different operations.

The spacers, staked in compressor wheels on each side of compressor blades, require three grinding operations: (1) squaring the ends that butt against dovetail ends of compressor blades, (2) grinding the angle on the other end to conform with outer width and angle of compressor wheel and (3) grinding top of spacer to contour of wheel's outside diameter.

Spacers, fabricated from AISI Type 1020 steel, are squared and angle-ground on one machine. Using the same work-holding blocks, the spacers



**Fig. 6. Small electric-motor rotors are ganged on steel arbors for finishing. Drive wheels rotate the rotors at the proper speed.**

are next contour ground to conform to the compressor wheel outside diameter. This operation is done on a second machine that is equipped with an adjustable pivot arm. Fixture blocks are designed so the spacers can be positioned with the square end, angle end or outer face presented to the abrasive belt. Grinding is done to tolerances of +0.000 and —0.005 inch at the following rates: 200 per hour for squaring, 150 per hour for angle-surfacing and 40 per hour for outside diameter contour grinding.




**Fig. 7. (above) Operator sweeps pivot arm back and forth to generate spacer outside diameter. Fixture blocks are also designed to position spacers, inset, for square and angle grinding.**

**Fig. 8. (right) Leading and trailing edges of jet engine buckets are belt ground at a rate of 100 per hour on this special fixture.**

To grind both the lead and trailing edges of jet engine turbine buckets in a single operation, Lakeshore Industries installed a belt grinder equipped with a special cam-oscillated work-holding fixture, *Fig.* 8. Previously, the cobalt-chrome alloy-steel forgings, requiring 0.040 to 0.060 inch stock removal to within 0.003 to 0.006 inch over the high limit, were scribed and ground by hand. Daily production rate of 600 buckets is now met by a single machine operator, a threefold productivity increase.

The bucket tip is inserted in the fixture's idler chuck and the bucket root is locked in the dovetail recess of the opposing chuck. The reverse face of this chuck is surface-contoured to compensate for a $\frac{3}{8}$-inch difference in the lengths of the leading and trailing edges. As the operator turns the fixture wheel, the synchronized cam-action moves the revolving bucket span-wise across the belt face, to present first the longer leading edge and then the shorter trailing edge. Oscillation is necessary so the protruding shoulder on the bucket root will clear the abrasive belt. The fixture, mounted on the automatic feed table, is also angled on the horizontal to compensate for blade taper.

Combination of the equipment maker's intimate experience with belt grinders and the tool engineer's knowledge of what has to be done can result in simple answers for difficult machining operations. The inherent advantages of belt grinding—comparatively low initial equipment expenditure, minimum operator training, high-speed production, precision size control and fine surface finishes—can be enhanced by simple but ingenious fixtures. All it takes is a little imagination.



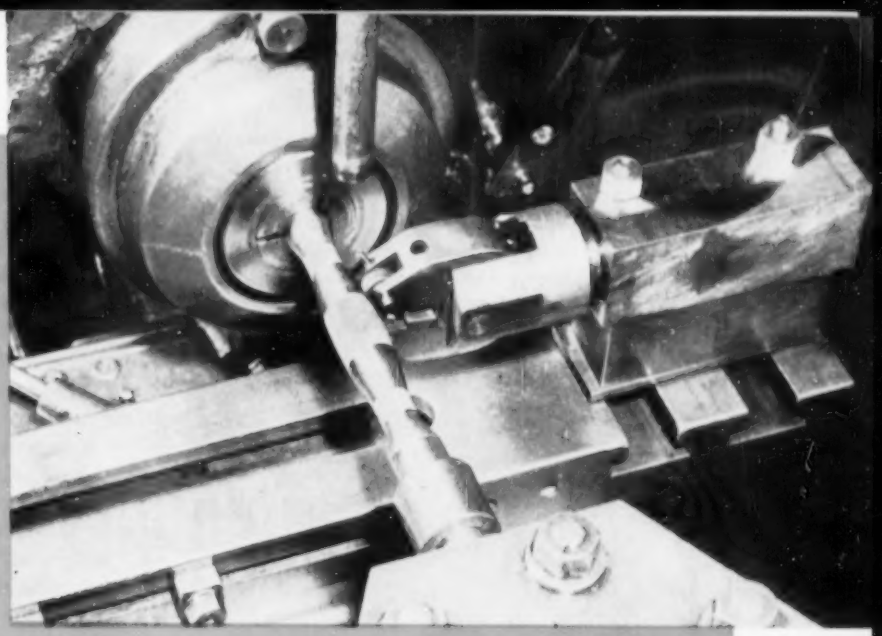


Fig. 1. Machine setup for knurling a workpiece with contoured surface in an automatic screw machine. The tool is adaptable to knurling any workpiece similar to the one shown.

# Screw-Machine Knurling Operation ... Solves Production Problem

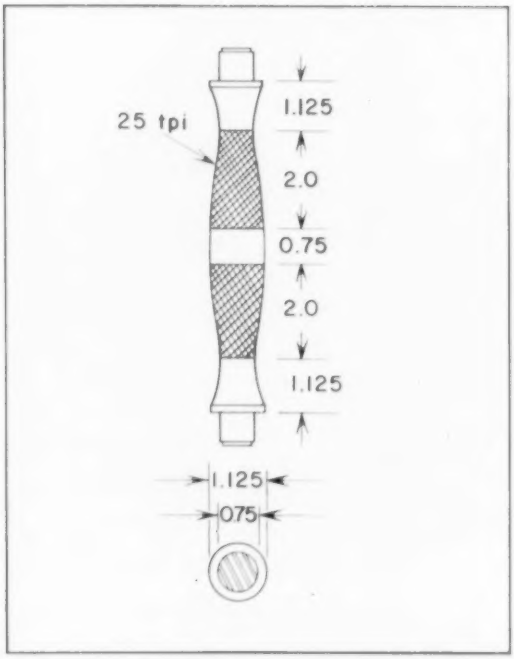



Fig. 2. Knurling the curved surfaces on this part presented an unusual problem.

FACED WITH THE PROBLEM of producing a knurled surface on a contoured workpiece at low cost, engineers at the Machinery Products Co., Lancaster, Pa., came up with an ingenious solution. Use of a novel toolholder permits knurling to be performed on a No. 3 Warner & Swasey automatic screw machine, *Fig.* 1.

Originally, the possibility of knurling the part, *Fig.* 2, on a knurling machine, with two contoured knurls, each the same length as the part, was considered. Since this would have involved a rather large capital equipment expenditure, efforts were made to utilize available equipment in the plant. One proposal was to knurl the part with a standard straight-faced diamond knurling tool in an automatic screw machine. This experiment failed, since a straight-faced knurl, when moved along a curved surface, distorts and deforms the knurled surface already formed by the leading edge.

Accordingly, special convex-faced knurls, which could be placed in a standard holder, were tried out. It was found that a knurl with a small width was much less apt to distort the pattern already formed in the workpiece than a knurl with greater width. The knurls eventually selected were 3/8 inch wide.

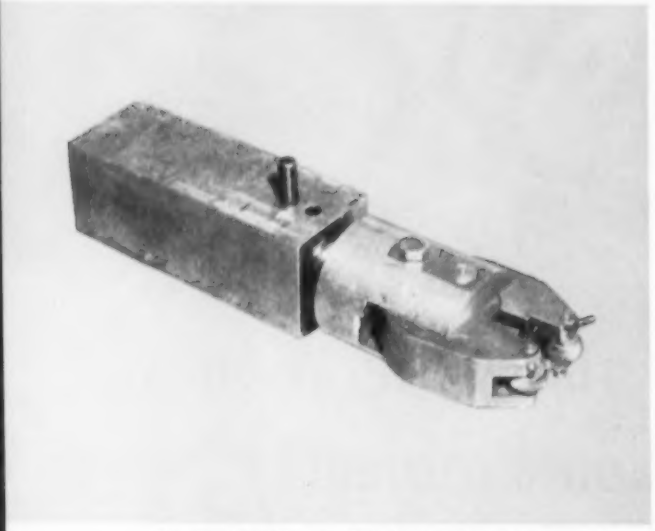


**Fig. 3. Knurling toolholder head is free to slide in and out of shank, enabling knurls to follow a curved surface.**

Another problem remained. Depth of tool penetration is highly important in producing a uniform knurl. For this reason, use of the same tracing attachment utilized in turning the contoured surface of the workpiece would not give satisfactory results. Thus it was necessary to devise some means for providing constant pressure against the surface being knurled. To provide this constant pressure, a special knurling toolholder was designed, *Fig.* 3.

The cylindrical shank of the knurling head is a sliding fit inside a special holder. A spring in the holder maintains constant pressure on the head, forcing it to follow the contours of the workpiece. A pin in the shank rides in a groove in the holder, permitting the head to move in and out but restraining it from rotating, *Fig.* 4.

In production, the knurls are made to contact the workpiece at the same time the automatic feed is engaged and one of the two knurled areas on the workpiece is generated. When the end of the knurled area is reached by the tools, a trip on the carriage feed is actuated and the knurls are immediately withdrawn, to prevent excessive dwell. This procedure is repeated for the other knurled area.

The tool for knurling on a curved surface solved the specific problem at hand. Company officials believe that the tool is also capable of knurling workpieces with elliptical and other out-of round cross sections, thus eliminating the need for costly special equipment.

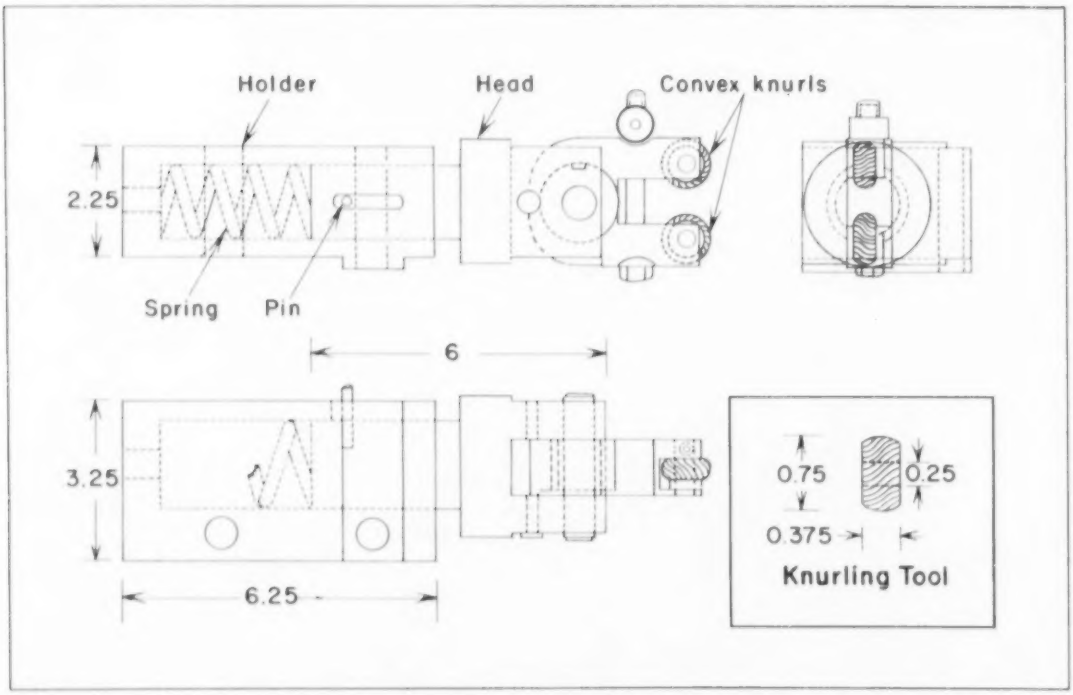



**Fig. 4. Construction details of knurling toolholder.**

# Calculating Compound Angles

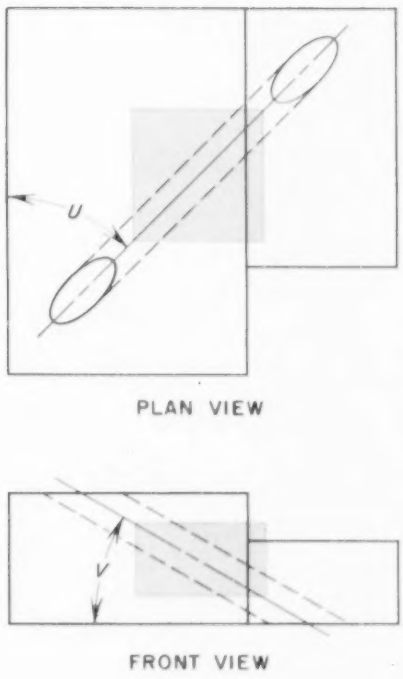
**By Allen M. Johnson***
**President**
**Oak Knoll Engineering Service**
**Springfield, Mass.**

BY DEFINITION, a compound angle is an angle made by cutting a rectangular block at an angle to two of its surfaces. Many machinists have difficulty in setting up jobs calling for compound angles; however, compound angles are merely combinations of simple right-angled triangles which anyone with a basic knowledge of trigonometry can solve.

When a compound angle is to be machined, two angles must be found: the angle of rotation and the angle of tilt at which the holding device should be set. The angle of rotation is found in the plan view and the angle of tilt can be calculated from given angles found in two views of the part.

If one of these given angles appears in the plan view and another in an elevation view, *Fig.* 1, the angle of rotation is either the angle shown on the part drawing or its complementary angle. The an-

*Senior member ASTE Springfield chapter.



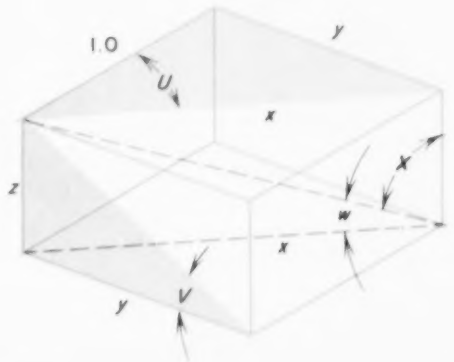




**Fig. 1. When plan view and front view are shown on a drawing, only the angle of tilt need be calculated.**

gle of tilt is either the calculated compound angle or its complementary angle, the latter being the case illustrated.

Under these conditions, the formula for finding the compound angle is:

$$\tan W = (\tan U)\ (\tan V)\ (\cos W) \quad \ldots\ldots\ldots\ldots (1)$$

When the given angles are found in two elevation views, such as front view and side view, *Fig.* 2, rotation and tilt angles must both be calculated. The formula for determining the angle of rotation is:

$$\tan C = \frac{\tan B}{\tan A} \quad \ldots\ldots\ldots\ldots (2)$$

The formula for calculating the angle of tilt is:

$$\cot D = \frac{\tan A}{\cos C} \quad \ldots\ldots\ldots\ldots (3)$$

Derivation of the three formulas follows:

FORMULA NO. 1

$$x = \frac{1}{\cos U}$$

$$y = 1\ (\tan U)$$

$$z = y\ (\tan V)$$

$$\tan W = \frac{z}{x} = \frac{y\ (\tan V)}{\frac{1}{\cos U}} = \frac{(1)\ (\tan U)\ (\tan V)}{\frac{1}{\cos U}}$$

$$= (\tan U)\ (\tan V)\ (\cos U)$$

FORMULA NO. 2

$$p = 1\ (\tan A)$$

$$q = 1\ (\tan B)$$

$$\tan C = \frac{q}{p} = \frac{1\ (\tan B)}{1\ (\tan A)}$$

$$= \frac{\tan B}{\tan A}$$

FORMULA NO. 3

$$r = \frac{p}{\cos C}$$

$$\cot D = \frac{r}{1} = \frac{\frac{p}{\cos C}}{1} = \frac{\frac{1\ (\tan A)}{\cos C}}{1}$$

$$= \frac{\tan A}{\cos C}$$

These three formulas cover the majority of compound angle problems encountered in the shop. Variations resulting from different directions of the given angles may necessitate the use of other functions of the angles, but the method of solution is basically the same as the one described.

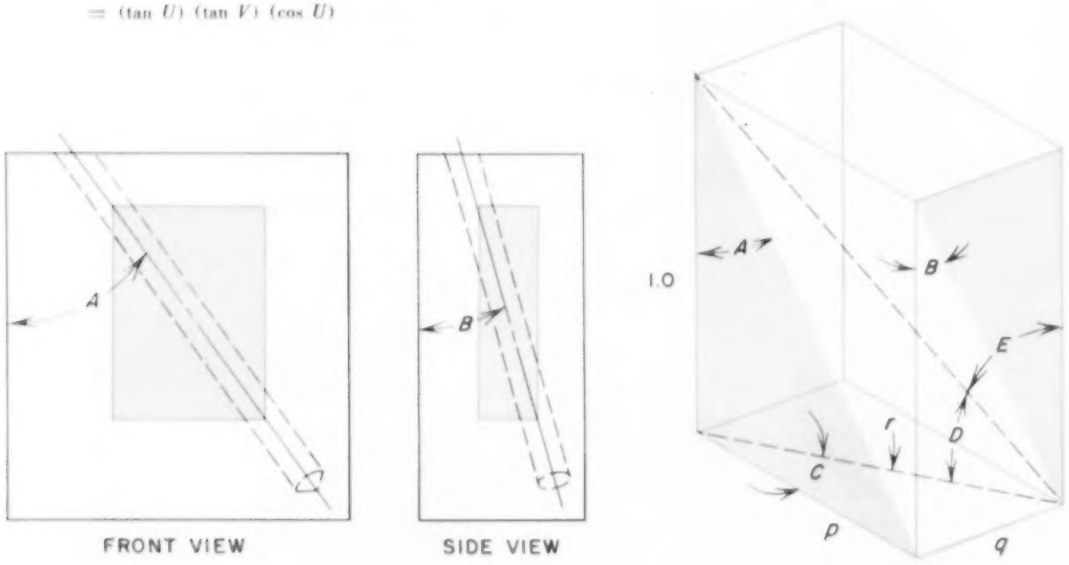



**Fig. 2. When two elevations are shown on drawing, both the angle of rotation and angle of tilt must be calculated.**

aste



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George M. Hargreaves, editor of ASTE Data Sheet Service, answers questions about this long-established Society service in his office at ASTE Headquarters. Specifications in the 54-page catalog on this desk have been condensed into ten pages of easily read Data Sheets.

# DATA SHEETS

## another member service

ASTE Data Sheet Service is almost as old as the Society itself. Begun only three years after ASTE's inception, it was conceived as a function of the National Standards Committee. The secretary of this committee acted in the capacity of editor until 1954, when George M. Hargreaves was named full-time Data Sheets editor.

To answer some of the questions members receiving Data Sheets have been asking, Editor Hargreaves was interviewed. Here are his answers to the questions posed:

**What is the story behind Data Sheets?**

ASTE Data Sheet Service was originated in 1935, as a function of the Standards Committee. The service was visualized as a means of supplying specification data on products of interest to tool engineers, comprising the entire Society membership.

Until about three years ago, the Data Sheet Service was operated entirely by the ASTE National Standards Committee. The committee recognized that operating a publishing property interfered with the Society's standards program and, in 1954, the administration of the service was turned over to the headquarters staff. At the present time, the National Standards Committee's responsibility for Data Sheet Service is maintained by a subcommittee which reviews all material before it is published.

Neatly pegging Data Sheets' contribution to the over-all Society objective of disseminating tool engineering information, Mr. Hargreaves explained: Process information is available to members through articles in THE TOOL ENGINEER, at chapter and national meetings and through the Society's handbooks. Product information is available through their attendance at Tool Shows and, to a limited extent, through advertisements in THE TOOL ENGINEER. The Data Sheets are intended to fill the gap in such product information and, at the same time, offer the producers of industrial equipment an opportunity to reach the membership with detailed




**As near as your phone or the nearest mailbox, brochures describing Data Sheet Service are available from National Headquarters.**

technical data on their products. This is the only medium through which this information may be transmitted to all ASTE members.

**What does your job as Data Sheets editor encompass?**

The job is primarily one of editing and condensing material found in a subscriber's catalog to fit the Data Sheet format, without losing any important technical information. Last year we compressed specifications in the 54-page Richards Brothers punch and die catalog into ten pages of Data Sheets. This was accomplished by eliminating all reference to prices, and omitting extraneous matter.

**Who foots the bill for this valuable service?**

Data Sheet Service is a nonprofit, but self-sustaining function. The cost of this service is borne entirely by the companies for whom we distribute the Data Sheets. These companies, called Data Sheet subscribers, are offered all the advantages of mass printing and mailing, bringing the cost down to a minimum. It has been estimated that it would cost the individual subscriber about two and one-half times the amount our Society charges for printing plates, paper, printing, envelopes, handling, postage and all production overhead.

**Who contacts prospective subscribers?**

Sales of ASTE Data Sheets are handled by the regional advertising managers who sell advertising space in THE TOOL ENGINEER magazine and exhibit space at Tool Shows as well. Each member of the sales force has an assigned territory, as follows: Austin Cragg, New England; Frank Baldwin, Middle Atlantic; Clarence Etter, Central; Dick Cleary, Ohio; Alan Cobleigh, Michigan; Stan Girard, Western; Bob Ahrensdorf, Pacific Coast. Our sales force does such a good job of selling the ASTE package that it brings in nearly as many ASTE membership applications as it does advertising contracts.

**How are Data Sheets distributed?**

The entire Society membership receives ASTE Data Sheets. As each new member joins the Society, he receives a set of the Data Sheets which are currently in print. At the present time, this set consists of a little better than 100 sheets.

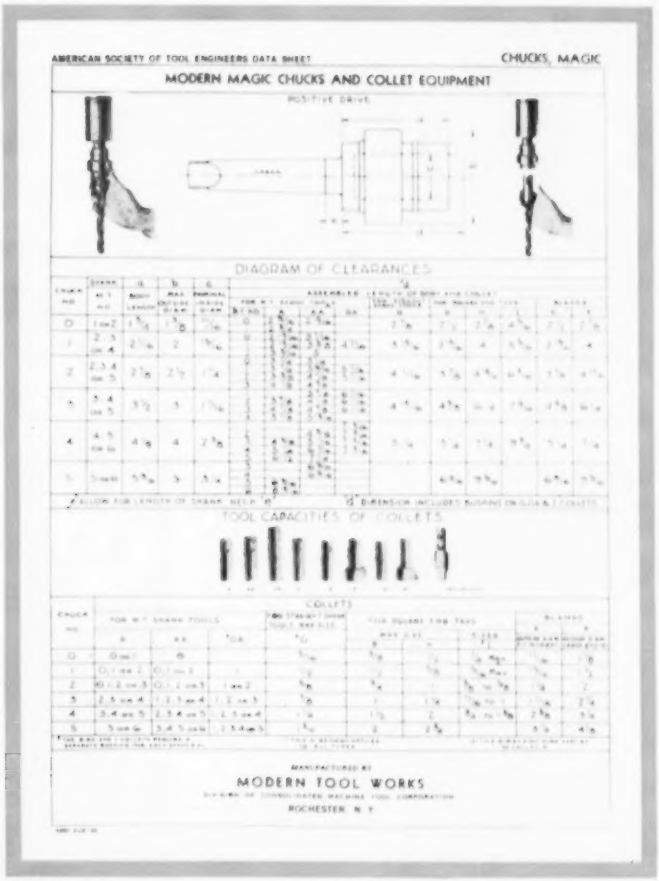
**How many different Data Sheets are distributed in a year?**

During the past few years we have averaged about sixty different sheets per year. Each printing run is 40,000 copies of every sheet published, but we anticipate increasing this run to 45,000 copies very shortly.

We schedule four mailings each year in which any product of interest to tool engineers may be covered. We also have scheduled up to six "package" distributions in a single year. A Data Sheet Package consists of several companies' Data Sheets on the same product.

**What lies ahead in the way of future changes for the Society's Data Sheet Service Program?**

Through continual study and research of the service, we are constantly striving to improve the Data Sheets format, their quantity, frequency, and utility to the member for whom they were designed.



AMERICAN SOCIETY OF TOOL ENGINEERS DATA SHEET — CHUCKS, MAGIC

MODERN MAGIC CHUCKS AND COLLET EQUIPMENT

POSITIVE DRIVE

DIAGRAM OF CLEARANCES

TOOL CAPACITIES OF COLLETS

COLLETS

MODERN TOOL WORKS

ROCHESTER, N. Y.

**One of the first Data Sheets, published in August, 1935, describes specifications for magic chucks and collet equipment. Later editions added index numbers, and the general appearance of the sheet was improved through use of type rather than hand lettering.**



**Editor George Hargreaves, shown at the blackboard, points out a graphic analysis of the ASTE Data Sheets Service program for the benefit of assembled regional advertising managers who contact prospective subscribers.**

# California Chapters



**Council Chairman Ed Cutler, left, a past chairman of San Gabriel, welcomes National Director Ben Berlien, guest speaker, who briefed the council of recent developments in national activities and advocated a closer liaison between chapter and national officers.**

# Pull Together

Phenomenal growth in ASTE membership in California is reflected in parallel growth of the California Council of Chapters, now in the fourth year of its existence. Since its inception in January, 1954, the number of chapters in the council has doubled, with all ten California chapters represented at the most recent meeting on July 13. Truly great strides have been made since the late Louis Biehler of San Fernando Valley gathered together fifteen men from five Southern California chapters to exchange program ideas, improve interchapter relations, and suggest joint projects "for the good of ASTE."

The natural trend to consolidate efforts was brought about by high regional concentration of membership and geographical separation from other ASTE chapters. In California, as elsewhere across the nation, this trend was carried one step further in organized council meetings. Chapter-level committee activities were found to be strengthened through an exchange of ideas and experiences and, more recently, through the counseling of men working on the national committees.

At the recent Los Angeles meeting, National Director Ben Berlien struck the keynote for the ensuing individual committee sessions when, in addressing the combined assembly of 63 chapter officials, he cited the benefits to be gained from close liaison between chapter and national committees engaged in the same effort. He commented that, although chapters operate individually, they can gain greater insight and act more effectively through close association with the more experienced national committeemen.

Taking advantage of the availability of local experience, Council Chairman Ed Cutler assigned a California representative from each of the national committees involved to preside at the individual sessions of chapter committeemen. These men were able to inject explanations and interpretations of national Society operation, and helped keep the discussions moving in the right direction.

National committeemen present were Larry Pomerantz of programs; Vernon Gallichotte of professional engineering; Rudolf Regen of public relations; Ralph Chrissie of membership; Art Crom of standards; Ed Cutler of education; and Council Secretary Ray Garriss of technical publications. Vice President Wayne Ewing added brief remarks on the success of the meeting. A report of the previously held standards meeting was given by Lincoln Mager, San Gabriel; and the apprentice training program, developed by Los Angeles area chapters, was described by George Adams.



**Larry Pomerantz, Long Beach, a member of the National Program Committee, heads the discussion table, flanked by chapter program chairmen. Left are Earl Williams, San Diego; and Ann Baker, Riverside, seated. Standing are: Phil Christoffersen, Riverside; Everett Nance, San Gabriel; and Alton Tyler, San Diego. Standing right are: Gerald Hall, Golden Gate; and Glen Crider, Los Angeles. Seated are Irvin Also, Long Beach; Ray Journeay, Santa Ana; Joe Bangs, San Fernando. Object of the session was improving programs for all chapters.**





Ralph Chrissie presides at the meeting of membership chairmen who are, counterclockwise from him: Frank Achuff, San Diego; W. D. Peck, Centinela Valley; O. G. Feuling, Riverside; John Cox, Los Angeles; Lyman Allen, Long Beach; Peter Nardulli, San Gabriel; Jack Early, San Fernando Valley; and David Reichert, Santa Ana Valley, next to Mr. Chrissie.



Seated for lunch, council members anticipate a stimulating afternoon of discussions, and talks by Vice President Wayne Ewing and National Director G. Ben Berlien.



Public relations and editorial group was headed by Rudolf Regen, center. Left along table are: Roland Hamel, Los Angeles; D. H. Dal Soglio, Long Beach; Leon Bohrer, Santa Ana; Charles Grun and Alger Newman, San Diego. Right are: Suzanne Olson, assistant news editor, *The Tool Engineer*; R. G. Chown, Long Beach; Walter Hupaylo, Riverside; Les Albright, San Diego; Robert Ditrick, San Fernando Valley; and Mike Hulett, Santa Ana Valley.

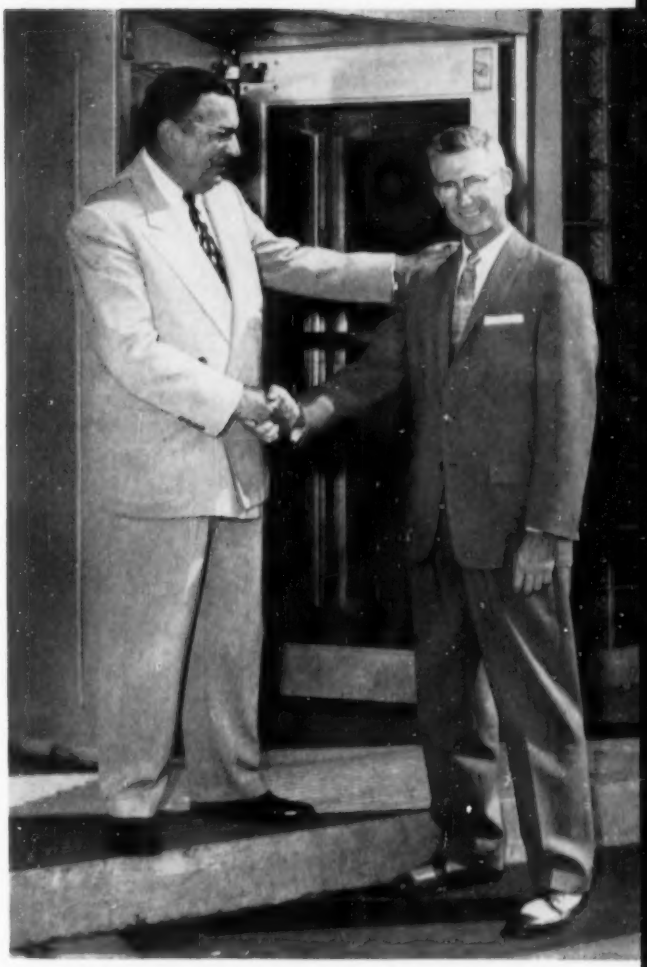
# Education Director Named

Recognizing the imperative nature of the demands made by our economy for men skilled in tool engineering. ASTE has consistently put more and more emphasis on programs designed to meet this need. Its educational activities, ever on the increase, have been diversified to reach, guide and help tool engineers in all stages of development.

The National Education Committee, backed solidly by the Society's officers and directors, has mapped out a program so broad that it now guides youths through high school and apprentice training programs as well as through technical institute and junior college activities; it also sets standards and plans curricula for college and university students. In addition, it works toward creating mutual recognition between management and educators of the demands and responsibilities of each for the other, and it is consistently planning programs to increase the usefulness of tool engineers now working in industry.

The latter goal has been approached from many angles—through on-campus conferences, regional educational conferences, and new chapter-level programs such as the Advanced Tool Engineering Practices Program and Die Design Course being written.

The vast scope of such a program demands centralized direction and coordination. The answer to this need was felt to be an education director for the Society. Such a man had to fulfill certain high requirements, have a sound industrial engineering background, and be well versed in vocational as well as educational methods. These requirements were found in the person of Gilbert Seeley, who has accepted the responsibilities of directing the Society's national educational program.



**Executive Secretary Harry E. Conrad welcomes Gilbert Seeley, new Education Director, to ASTE Headquarters.**

Mr. Seeley, who was recently named Education Director of ASTE, is eminently qualified to handle the responsibilities of the position. His college background combines industrial engineering and mathematics with industrial and vocational education, and industrial psychology. He holds a BS degree from Eastern Michigan College, and an MA from the University of Michigan.

Since graduation, Mr. Seeley's work in the field of education includes instructing classes in industrial education and mathematics, coordinating and establishing apprenticeship training programs, and acting as director of vocational education and practical arts in the Union School District, Jackson, Michigan. This last position required working closely with civic, business and industrial organizations in the development of employee training programs.

In addition, Mr. Seeley has worked directly in the field of production engineering. A member of numerous educational, vocational and civic organizations, he has spoken many times to such groups.

# In the

Two pilot chapters were chosen as proving ground for the Advanced Tool Engineering Practice Program, to evaluate its effectiveness before the course was offered to other ASTE chapters. Buffalo-Niagara Frontier and Jackson were sampled, as representative large and small chapters, near enough to Detroit for adequate direction.

Questionnaires from graduates in both chapters indicate an enthusiastic reception to the program, designed to keep tool engineers in industry abreast of current developments and future trends. Additional runs in other selected locations this fall will further test the plan before it is offered to all interested chapters of the Society.



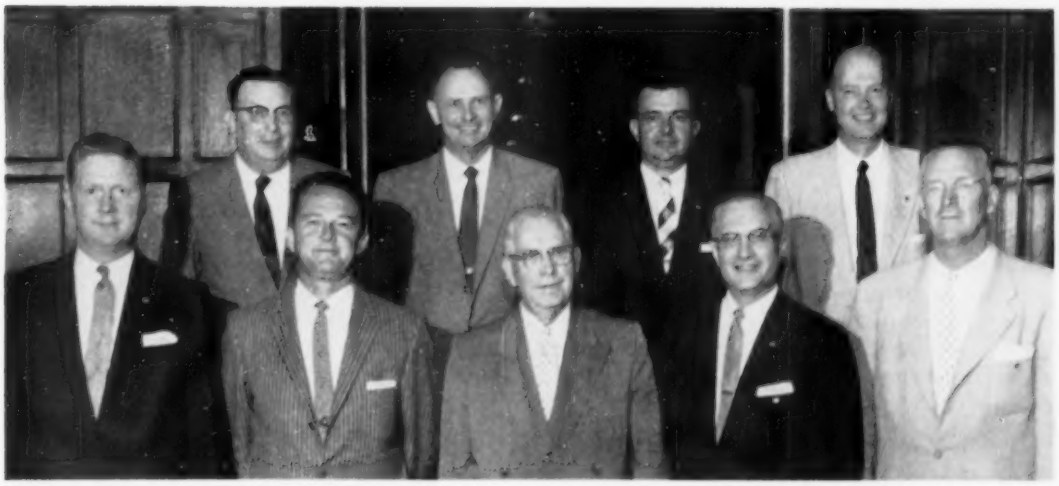


**Students of the Advanced Tool Engineering Practices course at Jackson, above, await the start of the evening class while lecturer and course coordinator confer at the blackboard. Students from the Buffalo-Niagara Frontier course, below, pose at the final session, at which they received certificates of completion.**

# national SPOTLIGHT



Visiting Society headquarters from the Sydney chapter is Sidney C. Grieve, chief production engineer, Email, Ltd., right, who is pictured with the research fund director, Leslie S. Fletcher.



Shown at the Progress Committee Meeting which was held at the Hotel Statler in Detroit on July 12 are, front row from left: National Secretary David A. Schrom; past presidents, Harry B. Osborn, Jr., 1955-1956; Irwin F. Holland, 1948-1949; and Howard C. McMillen, 1956-1957; and President Harold E. Collins. Second row from left, are Executive Secretary Harry E. Conrad; former director, Ben Hazewinkel; National Constitution and Bylaws Committee Chairman Arthur Cervenka; and Vice President William A. Moreland.



At Rockford's annual playday, Past Chairman George Johnson, Ed Conde, and Burton Rush compare score cards.

# chapter outings

ASTE'ers across the nation and in Canada enjoyed softball, golf, swimming and sailing, along with many other outdoor activities at their chapters' annual outings during the past summer. Sunburn and poison ivy were not the only results of the picnics, for many prizes were given out including some for the most honest golfers. Here is the picnic news as told by each editorial chairman:

At Chicago 130 members and guests enjoyed the chapter's annual golf day which was held on June 22 at the Southmoor Country Club. Prizes, dinner and entertainment were on the program.

Dayton's annual golf party and banquet was held at Walnut Grove Country Club with an attendance of 200 members. Practically everyone was fortunate enough to receive a golf prize.

Barbecued chicken was on the menu for Evansville's annual picnic on July 8. Approximately 195 members and guests representing several suppliers from the area were present. A good time was had by all and Evansville is looking forward to the occasion again next year.

Fairfield County's fourth annual outing drew 195 people to Sante's Restaurant, in Milford, Connecticut. Twenty-eight prizes were given to the winners of the following events: softball throw, nail-driving contest, wheelbarrow navigation race, horseshoe pitching, three-legged race, egg toss, tug-of-war, and

gourmet's decathlon. Twenty-two members won prizes which had been raffled and there were two door prizes consisting of a portable radio and Remington rollectric shaver.

Hamilton's 16th annual field day was held at the Dundas Valley Golf & Country Club. Golf winners were: low gross, Jack Birtwhistle; second low gross, Dave Mackey; first low net members, S. Antolovitch; second low net members, J. H. Crawford; first low net visitors, R. Foote; second low net visitors, L. Penson; hidden score, A. Larman; and most honest golfer, J. Hetherington. Putting prizes went to E. Williams and K. Johnson. First prize in the horseshoe pitching went to Jack Hillier and R. Gibbs; second prize to D. Evans and G. Nesbitt. The guessing contest went to C. Taylor. Thomas Greenaway won a special draw prize of a spinning rod and reel. After a smorgasbord dinner the draw was made for 159 prizes.

Heading the field day committee was Sam Johnston, ably assisted by Ralph Mayers, Bruce Bone, Gordon Hall, H. Boucher, Les Preston, Sam Morgante, G. English, J. Hillier and D. McIntyre.

At Portland, Oregon, the third annual golf tournament was held at Broadmoor Golf Club, with beautiful weather an important ingredient of the good time enjoyed by all. Gary Frazier carried away the trophy cup for the event.

"Playday" at Rockford, attended by some 350 members and guests, featured rod and reel casting, as well as golf. Forest Hills Country Club was the scene of this annual event.

Saginaw Valley's summer golf outing boasted a day in the sun with golf a good excuse. Luncheon and dinner were on the day's agenda at Rolling Greens Country Club, and neither rain nor ants spoiled the good food. Among the prizes was a shotgun raffle won by Russell P. Sauter, with contributions used to expand the education fund. This good fellowship affair was chairmanned by William Salbenblatt, assisted by Steve Matthews and Robert Breidenbach. A good time was had by all.



**Saginaw Valley's Chairman E. A. Reed follows the precedent set by a group of hungry ASTE'ers as they match servings with appetites.**



**Enjoying themselves at Fairfield County's annual picnic are, from left: Joseph Byrnes; Henry Busby, second vice chairman; Emil Judge, outing chairman; Russell Drescher, treasurer; Frank Dubuque, first vice chairman: John Finn; Matty Luciani; E. R. Lambert; and Bud London. Front row, from left, are: Lenny Emmersen; Jay Sprong; Leo Timothy; James Ridge; Norris Green, chairman; Victor Papp; and Tom Stankowski.**

# chapter news and views

## Pittsburgh Sponsors Educational Series At Carnegie Tech

A five session program on grinding wheels will be presented at Carnegie Institute of Technology commencing 7:30 p.m., Monday, October 7, 1957. This is a continuation of the educational clinic which, to date, has included technical discussions on carbides and tool steels.

The first meeting will deal with manufacturing (quality control points) and safety—to be handled by the Simonds Abrasive Company and Grinding Wheel Institute personnel, respectively.

The second meeting, October 14, will be presented by The Carborundum Company, and will concentrate on vitrified (low speed) bonded wheels.

On October 21, the Bay State Abrasive Products Company personnel will discuss resinoid or organic (high speed) bonded wheels.

October 28 will have as its featured topic diamond wheels—to be discussed by Norton Company personnel.

The last session and special ASTE dinner meeting on November 1 will feature "Stump the Experts" night. The participating companies will make up a panel in order to answer all of the questions. Certificates of completion will be awarded at this time.

Some of the top technical and practical men in the field will be on hand for these presentations. Registration fee for the five-day session is $2 for regular members and $5 for nonmembers. Those wishing to attend may contact any of the local members, or W. E. Baker, Jr., chairman, education committee, Universal Cyclops Steel Corporation, 507 Grant Building, Pittsburgh.

—*Russell L. King*

## Californians Organize Course



LOS ANGELES AREA—Tool design apprenticeship in action at Vickers, Incorporated, El Segundo, shows from left: Milton L. Rosenblatt, apprentice; J. R. Reich, plant superintendent; Charles E. Pierce, apprentice; and state apprenticeship consultant, Harold Kamp. The apprenticeship program is being organized by the Long Beach, Los Angeles, San Gabriel, San Fernando and Centinela Valley chapters.

Accepting an invitation from the California State Apprenticeship Board, under the guidance of Harold Camp, to local ASTE members to organize an apprenticeship training program, the California Council of Chapters designated the five chapters bordering Los Angeles to support and put into effect such a course. These chapters assigned education chairmen or appointed apprenticeship chairmen to handle the job. Participating chapters were Los Angeles, Long Beach, San Gabriel, San Fernando, and Centinela Valley.

George Adams, education chairman of the Los Angeles chapter, was elected chairman of the apprentice advisory committee. Edwin L. Cutler of the National Education Committee, served as adviser on the training program regarding local problems, and in the national interest of the Society in education problems.

Edwin Thomsen of the Los Angeles Trade Advisory Committee of the school board wrote the curriculum and submitted it to the advisory committee.

This training program will be fully under way September 15, 1957. Companies represented include national as well as local concerns: Vickers, Incorporated, El Segundo Division; Utility Metal Products, Incorporated, Pasadena; B & M Engineering Company, Burbank; Bailey Tool & Die Design, West Covina; and Universal Metal Rollforming Co., Lynwood.

To assure that students are of high caliber, requirements for the training program include graduation from high school and favorable results from mechanical aptitude testing. This course has been widely accepted among manufacturing concerns and student groups. The program conforms to all the requirements set by the California State Division of apprenticeship standards.

Additional information regarding requirements for candidates for the training program can be had by contacting Edwin Thomsen, Coordinator of Apprenticeship Education, Los Angeles City Schools, 1205 W. Pico Blvd., Los Angeles 15, California.

## San Fernando Hears Story of Universe

Ladies Night at San Fernando Valley was highlighted by a talk by Dr. Lester Reukema, a professor at the University of California, Berkeley, whose subject was "Infinitesimal to Infinite." Dr. Reukema spoke for an hour and a half, giving graphic illustrations of the infinitesimal proportions of the basic building blocks of the universe, the atoms, and the electrons, protons and neutrons which comprise them. He described them as a miniature solar system, similar in activity to the earth's solar system in a galaxy of stars. Translating the astronomical figures involved into laymen's language, he then gave his thoughts on the universe, with its unending time and space, composed of matter and energy, and reflected upon the possibility of life or some form of intelligence on other planets in the universe. He concluded that the possibility of this is very real.

Looking for an answer to the origin of the universe, he set aside all conclusions except one which presupposed a power, personality, or an intelligence which permeates the entire universe, not from the outside.

During the meeting that followed bound copies of an entire set of chapter bulletins for the past year were presented to each of the chapters' executive council members. Presentations of San Fernando Valley's ASTE trivets were made to Dr. Reukema and Suzanne Olson, assistant news editor of THE TOOL ENGINEER, who was also present. —*R. E. Ditrick*

## Hartford Awards Scholarships



**HARTFORD—At City Club of Hartford, Conn., the following students received Scholastic Awards from the chapter: Herbert B. Kingsbury, University of Connecticut; William P. Guglielmi and William C. Eigenraam of State Technological Institute; Harry W. Anderson, chapter chairman; Eugenisjus Uzpurvis and Richard D. Brown of Hillyer College.** —*John Guzauckas.*

At a special dinner held on May 20 at the City Club of Hartford, Connecticut, the following students received scholastic awards from Hartford chapter: Herbert B. Kingsbury, University of Connecticut, $300; Richard D. Brown, Hillyer College, $150; Eugenisjus Uzpurvis, Hillyer College, $150; William P. Guglielmi, State Technical Institute, $75; and William C. Eigenraam, State Technical Institute, $75.

Since 1952 the educational committee of Hartford chapter has tried to encourage more students to enter the field of tool technology. Scholarship awards to aid students in this field have been awarded each year to two students at State Technical Institute and Hillyer College. In 1956 one student at the University of Connecticut was chosen. In 1956 a year's subscription to THE TOOL ENGINEER was sent to 40 secondary schools in Central Connecticut. The subscriptions have been renewed.

The Hartford chapter had a booth at the Central Connecticut-Science fair held at the West Hartford Armory April 3 through 6. Information on material related to tool engineering was distributed to counselors and students. Plans are being made to enlarge this activity next year in awarding prizes for exhibits that are within the field of tool technology. —*John Guzauckas*

## University of Wisconsin to Hold Tool Engineering Institute



**MADISON—In cooperation with the University Extension Division, College of Engineering, Madison chapter is sponsoring the Seventh Annual Engineering Institute for engineering to be held at the University of Wisconsin. Pictured above is the University Engineering Building, where many of the courses will be offered.**

Madison chapter, in cooperation with the University of Wisconsin Extension Division and the College of Engineering, is conducting the Seventh Annual Engineering Institute on Tool Engineering September 25 through 27. Developments in new machining operations, cost reduction in tool engineering, a panel discussion on short-run tooling, die design and diemaking and tool design for special jobs will be some of the topics to be presented. In addition, presswork problems, toolroom operation, and the economics of machine replacement will be discussed. At a joint meeting with Madison chapter, Howard L. Roat, director of production engineering, A-C Spark Plug Division, will speak on "Applying Creativity to Production Engineering."

# Chapter News and Views



RALEIGH-DURHAM—Corsages and door prizes were distributed at the first Ladies Night planned by the chapter, still in its initial year. Shown enjoying the festivities are, standing: Mrs. and Mr. L. A. Jones, chairman; and Treasurer Vernon Miller and Mrs. Miller. Seated are: First Chairman L. F. Gay and his wife; and Mr. and Mrs. Paul Starr, Ladies Night chairman.

*—George W. Newton*



LONG BEACH—Chairman J. H. Medford presents an affiliate member plaque to John Pivovaroff of Pioneer Aluminum, Inc., and membership pins to C. E. Downing, A. B. Policate, L. R. Remmele, M. P. Nelson and Jack De Boon. *—G. E. Rucker*

## Santa Clara Tours United Airlines



SANTA CLARA—Members tour San Francisco International Airport.

A plant tour through the Maintenance Depot of United Air Lines at San Francisco International Airport was scheduled for Santa Clara Valley's July meeting. A guided tour through the depot included a trip through a DC-7 Mainliner which was in the overhaul dock. Tour guides pointed out the automatically positioning platforms which enable a maintenance crew to completely enclose a giant DC-7 plane in a set of working docks within minutes after the plane enters the shop. Other spots visited were the engine overhaul shop and the instrument overhaul shop. *—Dresden Smith*

## San Diego Members Hear Ed Cutler on Electronics

"Tool Engineering as Applied to the Electronic Industry" was the title of a talk by Ed Cutler, past chairman of San Gabriel Valley and currently chairman of the California Council of Chapters. Mr. Cutler's talk followed an extremely interesting 30-minute color film entitled "Eye to the Unknown," produced by his company, Consolidated Electrodynamics Corp.

## Annual Ladies Night At

### Lehigh Valley

Lehigh Valley ladies night, held at Hotel Traylor in Allentown, featured favors for the ladies, dinner, dancing, and entertainment. Greeting members and guests was Host Reiner Miller. Dinner followed the social hour with C. Kay giving the invocation.

Carl Occelletto acted as toastmaster during the dinner and led the diners in group singing. Dance music was provided by Ginger Sharkazy, who also presented an unusual show called Colorama, done in blacklite.

### Golden Gate

Golden Gate chapter's June meeting was given over to the ladies. The pleasant surroundings of the Arinda Golf and Country Club provided the setting for the annual ladies night. Over 224 members, guests and their wives attended the dinner and dance. This was the largest attendance number in many a year. Highlight of the evening was the presentation of corsages to each of the ladies present. A fine orchestra furnished dance music for the group. C. H. Driesbock arranged the program.

### Central Pennsylvania

Central Pennsylvania held their annual ladies night at Allenberry on the Yellow Breeches Creek, a lovely spot in Pennsylvania's mountains. A smorgasbord was served on the open patio facing the mountains. Each of the ladies received a silent butler as a favor and members and their guests enjoyed a play after dinner.

Present were Edward Rodgers of Baltimore chapter, who is a member of the National Membership Committee and David Schrom, National Secretary.

## Sacramento Holds Pre-Charter Meeting

An organizational meeting held for a proposed chapter in Sacramento had as its guest speaker National Director G. Ben Berlien, who described ASTE procedures, as well as delivered a technical talk on heat treating. National Committeemen present were Ralph Chrissie, membership; David Gustafson, editorial; and Dean Roulund, program. Also attending the meeting from Golden Gate chapter, which has given support to the movement for a Sacramento charter, were Jim Coulter, and Phil Freeman.

Early last spring the date of September 15 was set as a goal for chartering ceremonies and, from membership reports presented at the meeting, this chapter is within reach of its charter. Another prechartering meeting was scheduled for late August.



SACRAMENTO—National Director G. Ben Berlien doubles in brass by delivering a technical talk as well as a description of ASTE to Sacramento aspirants to chapterhood. At left are Phil Freeman, Golden Gate chairman; and Joe Koch, acting membership chairman. Right are Joe Oviatt, acting chairman of the embryo chapter; and Ralph Chrissie, vice chairman of the National Membership Committee.

## Monadnock Awards Loan Scholarships To High School Graduates

Vernon G. Klardie of Peterborough, New Hampshire, and Lawrence C. McClure, Jr., of Harrisville, New Hampshire, were recipients of two loan scholarships of $250 each, given by Monadnock chapter. These scholarships are given to high school graduates for use at 2-year technical schools, rather than colleges. The loans are interest free for four years and are renewable for the second school year if desired, and if student's school record warrants the reinstatement.

Mr. McClure will attend the New Hampshire Technical Institute, while Mr. Klardie's school has not yet been announced. Restricting the award to technical students gives aid to those boys planning to begin working sooner than college graduates.

*—David A. Piper*



MILWAUKEE—Scholarships amounting to $400 each were awarded to Richard A. Rogahn, left, and Henry S. Weigel, first and second place winners respectively. Presenting the award is Robert E. Bodendoerfer, a past chapter chairman. Both boys come from Boys' Trade and Technical High School, and plan to enter the mechanical engineering field, specializing in tool and die design.

*—Robert W. Thompson*



WENTWORTH INSTITUTE—Robert A. Chagnon, chairman, is pinning the president's service pin to Harold Staples for outstanding contributions to the student chapter. He is past secretary.



ERIE—Officers and committee members held a dinner meeting to discuss plans for the fall season. Pictured from left are: John J. August, Anthony J. Jaworowicz, William F. Snook, Arthur Pinczewski, Chairman Henry W. Sedler, Charles A. Williams, David J. Stout, Richard A. Banaszek, Samuel A. Florenzo, William Mieszczak, C. O. Merchant, E. C. J. Miller, Arthur Klein and Leo B. Weiner. Also present were Eugene E. Karnes and Treasurer Thomas G. Brown. *—Leo B. Weiner.*

## Sydney Program Deals With Deep Drawing

A two-part program on the manufacture and properties of Australian deep-drawing of steel sheet began with the July 10 technical session, at which Noel G. Fraser discussed manufacturing methods used in production and the limitations of the steel produced. Mr. Fraser, who is chief metallurgist for Lysaghts Works, Pty., Commonwealth Rolling Mill Division, also touched on the difficulties encountered by end users of the steel, by virtue of aging. The lecture was supported by a film and was followed by a visit of chapter members to the rolling mills at Port Kembla, N.S.W., on July 30.

*—Ronald L. Cowee*

# Coming Meetings




**1958 ASTE Tool Show**
**26th Annual Meeting**
**May 1-8**
**Philadelphia Convention Center**

## National

SEMIANNUAL MEETING—Oct. 31 and Nov. 1, Milwaukee. Included in the weekend program is Milwaukee chapter's Kickoff Industry and Education Night program, Nov. 1, designating the start of Industry and Education Month.

FINANCE COMMITTEE—Sept. 27, National Headquarters.

PROGRAM COMMITTEE, Sept. 27, with Philadelphia Host Chapter Committee, Sept. 27, relative to 1958 Annual Meeting, at Philadelphia.

PROGRESS COMMITTEE, Sept. 20, 21, Detroit.

## On-Campus Conference

TOOL ENGINEERING INSTITUTE, Sept. 25-27, at University of Wisconsin. Sponsored by Madison chapter of ASTE.

## Chapter

AKRON—Sept. 17, 7 p.m., plant tour of The Ohio Crankshaft Co., Cleveland. Heat treatment of metals.

CALUMET AREA—Sept. 23, 6:30 p.m., Paul Smidt's Restaurant, Whiting, Ind. "Economics of Tooling and Manufacturing" by Harry Conn, chief engineer, Scully-Jones & Co.

CHAUTAUQUA-WARREN—Sept. 19, 7:30 p.m., Plant tour of Allegheny-Ludlum Corp., Dunkirk, N. Y.

CINCINNATI—Sept. 10, 7:30 p.m., Engineering Headquarters. Dinner at 6:30. "Optical Tooling" by H. L. Nicholson, optical tool engineer, Bruning Co.

ERIE—Sept. 10, 6:30 p.m. dinner at Sportsmen's Athletic Club, 4102 West Lake Rd., Erie. Followed by plant tour of American Sterilizer Co.

EVANSVILLE—Sept. 9, 6:30 p.m. dinner at Smitty's Steak & Seafood House. "The Importance of Mold Rigidity in Injection Molding" by Rhodes N. Farris and Larry Spiedle, Dow Chemical Co. Also J. F. Moore and Milt Brummer of Indianapolis sales office of Rohm & Haas Co. will speak on New Gating for Acrylics and its Importance. S.P.E. members invited.

GRAND RAPIDS—Sept. 17, 7 p.m., Green Ridge Country Club. Ladies night.

GRAND RIVER VALLEY—Sept. 4, 1 p.m., Waterloo Rod & Gun Club (outskirts of Kitchener). Short meeting followed by annual field day. Plant tour to be held Sept. 20.

GREATER LANCASTER—Sept. 10, 8 p.m., Hershey Community Inn, Hershey, Pa. "Automation in Chocolate" Hershey Chocolate Corp. speaker to be announced. Tour of Hershey plant.

GREATER NEW YORK—Sept. 9, 6:30 p.m. dinner. Plant visit, Wright Aeronautical plant.

HAMILTON DISTRICT—Sept. 13, 5:30 p.m., plant tour of Atlas Steels Ltd., Welland, Ont. First bus leaves Hamilton Terminal 5:30 p.m. and tour is not limited to members.

JACKSON—Sept. 16, 7 p.m., Arbor Hills Country Club. Symposium on screw machine problems by members.

KANSAS CITY—Sept. 17, 7 p.m., Elks Club. 19 E. Armour Blvd. "Manufacturing Engineers and Their Effectiveness" by Howard McMillen, Philco Corp., and past president of ASTE. The meeting will be in conjunction with the American Society for the Advancement of Management.

KEYSTONE—Sept. 16, 7 p.m., Castle Restaurant, Main St., Scranton. "Barrel Finishing and Slide Honing" by Frank Soper, president, B.M.T. Corp.

KOKOMO—Sept. 19, 7:30 p.m., American Legion Home. "Manufacture of Industrial Diamonds for Production" by D. A. Trescott, vice president, Supercut Dist., Inc. Sept. 26, 7:30 p.m., plant tour of Midcentral Engraving conducted by B. Barth.

LITTLE RHODY—Sept. 5, 7 p.m., Johnson's Hummocks. "Brainstorming—Creative Thinking" by David P. Mohr, program manager, W.A.R.A.

LONG ISLAND—Sept. 9, 8:30 p.m., Garden City Hotel. "Industrial Relations"—speaker to be announced. Sept. 14, day of golf, followed by dinner, St. George Country Club.

MANSFIELD—Sept. 19, 6:30 p.m., Cleckner's on Highway 30 for dinner. "Grits That Grind and Norton Abrasives in Tool Grinding" and films by a Norton grinding engineer. Group discussion on grinding applications.

MISSISSIPPI—Sept. 9, 7 p.m., Walthall Hotel, Jackson. "Centerless Grinding" by Lige Render, manager, Grinding Machine Sales, The Cincinnati Milling Machine Co.

MUSKEGON—Sept. 10, 6:30 p.m. Spring Lake Country Club. Ladies night and a speaker from Michigan State.

NORTHERN MASSACHUSETTS—Sept. 17, 7 p.m., Greenfield Country Club. "Design and Application of Parts Feeders for Automatic Machines" by Floyd E. Smith, president, Terry Equipment and Engineering Co.

OZARK—Sept. 19, 8 p.m., Roberts Cafeteria, 6th & Joplin. "Economics of Tooling and Manufacturing" by Harry Conn, chief engineer, Scully Jones & Co. Illustrative color slides.

PHILADELPHIA—Sept. 19, 7:15 p.m., Engineers Club of Philadelphia. "Research and Development" by Malcolm F. Judkins, Firth-Sterling, Inc.

PORTLAND, ME.—Sept. 14, 10 a.m. to 4 p.m., Popham Beach, Maine. Steak fry for members and guests.

PORTLAND, ORE.—Sept. 19, 6:30 p.m., dinner, Burns Restaurant, N.E. 20th at Sandy Blvd. "Air-Powered Tools" by Elmer Beers, The Bellows Co. and Bob Burns, Thor Co. Report on Numerical system installation at Boeing Aircraft by Prof. Milton C. Sheely, who is chairman of the chapter.

RIVERSIDE—Sept. 10, 7 p.m., Mike's Cafe, Main St. "The Elox Process" by Harold E. Stark, West Coast representative, Elox Co. 30-minute film and question and answer period.

ROCKFORD—Sept. 12, 6:30 p.m., Svithiod Park. ASTE activities and 20th anniversary celebration.

SAGINAW VALLEY—Sept. 19, 7 p.m., Zehnder's Hotel, Frankenmuth. "Presentation on Styling" by George Pollard, assistant to head of design and color studios, General Motors Corp. Ladies night.

SAN FERNANDO VALLEY—Sept. 4, 7 p.m., Hody's Restaurant, North Hollywood. "New Era of Magnesium Tooling" by John R. Gibson, Reliance Magnesium Co.

SANTA CLARA VALLEY—Sept. 17, 7 p.m., Old Plantation Inn, Los Altos. "Tooling and Manufacturing Processes for Low-Volume Production" by Arthur Kromer, chief Mfg. Engineer, Ampex Corp. Also slides of special tooling.

ST. LOUIS—Sept. 5, Century Electric Tour will be conducted.

TRI-CITIES—Sept. 11, 6:30 p.m., The Rock Island Arsenal. "Work Simplification" by Charles Hanson, industrial relations supervisor, John Deere Co. Chairman Dan J. McKeon will introduce a chapter plan to honor chapter members of retirement age.

TWIN CITIES—Sept. 14, 6 p.m., The Arizona Room, Prom Ballroom, St. Paul. Banquet dinner; flowers and prizes for ladies; dancing and show.


## *Positions Available*

SALES REPRESENTATIVE — Qualified and aggressive young men wanted as sales representatives for leading manufacturer of quality dial indicators and related gages. Process engineering, tool designing, quality control and inspection experience important. Applications considered for major Eastern and Mid-Western industrial areas. Attractive compensation and expense allowance plus future advancement is assured. For further information please send personal resume with snapshot or photo to: Box 105, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TOOL DESIGNER—Experienced in designing jigs, fixtures, gages, rotary indexing fixtures and automated assembly fixtures for high-volume production. Due to this high-production requirement, the designer must be able to design class "A" tools. San Francisco manufacturer, steady employment, progressive and expanding company, international distribution, modern plant and equipment. Excellent company benefits. Please state age, education and minimum salary requirements in first letter. Include detailed resume of experience. Schlage Lock Company, P. O. Box 3324, San Francisco, California.

SALES ENGINEER—with cutting tool or tungsten carbide experience. Man needed for Detroit Area and one needed for Flint-Saginaw Area. Car furnished. Salary plus. Write to Box 106, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

PROJECT ENGINEER — Excellent opportunity for M.E., experienced in planning and estimating cost of parts and tooling. Familiarity with design and operation of progressive dies. San Francisco manufacturer, steady employment, progressive and expanding company, international distribution, modern plant and equipment. Excellent company benefits. Please state age, education and minimum salary requirements in first letter. Include detailed resume of experience. Schlage Lock Company, P. O. Box 3324, San Francisco, California.

REPRESENTATIVES WANTED — for accepted line of precision measuring instruments. Several lucrative territories available. State territory covered and lines carried. Replies will be kept confidential. Write to: Box 104, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Michigan.


# chips and chatter

**Des Moines** heard George John Stevens, machining engineer in the metallurgical dept. of Armco, Baltimore Works, discuss "Machining Stainless Steels." He gave some technical aspects of the subject. The "gimmick" session was given by Earl Volkamer on Collet Stops. Thirty-five members attended this meeting.

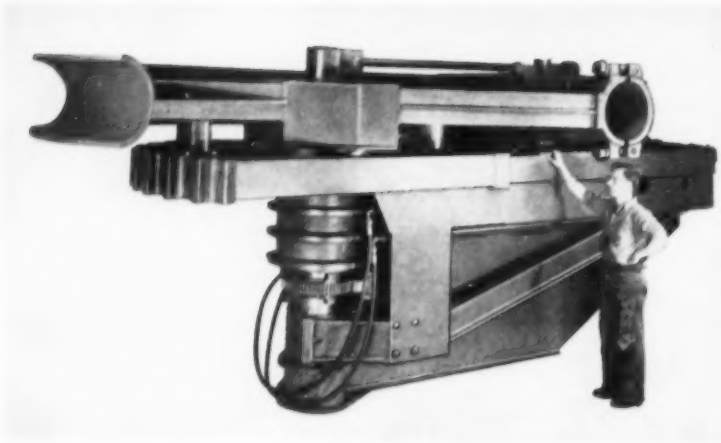
Harry Conn, chief engineer of Scully-Jones & Company, addressed **Long Beach** members on the subject "Optimation" recently. The presentation was an explanation of the optimum cutting speed or the minimum manufacturing cost-cutting speed.

**Portland** members heard Donald M. Laflin of Giddings & Lewis Machine Tool Company speak on "Automation by Numerical Control. At a recent dinner meeting William Simpson, first vice chairman, and Robert Erickson, program chairman, met with Walter Brenneke, editorial chairman, Suzanne Olson, assistant news editor of THE TOOL ENGINEER, and Dean Rouland, area program chairman, for a joint session on program and editorial matters.

M. E. James of Fabriform Metal Products addressed **Santa Ana Valley** on the subject "Brazing Is Easy" at the chapter's July meeting.

A ladies night program at **St. Louis** featured Harry W. Riehl, president and general manager of Better Business Bureau of St. Louis, to speak on "A Safe Place in Which To Trade." Mr. Riehl explained how 2600 business institutions in this area have cooperated to make St. Louis safe for shoppers.

St. Louis was host to a Regional Program Conference previous to this meeting, at which program chairmen from surrounding chapters of Louisville, Decatur, Peoria, Evansville, Joliet, Syracuse, Springfield, Illinois, and St. Louis were present.

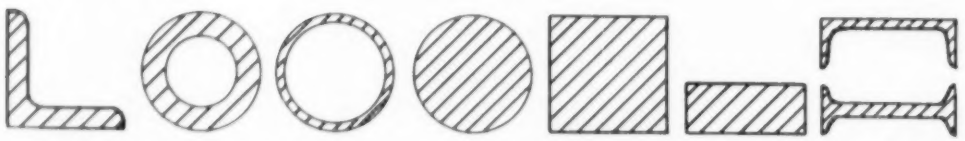


Wallace has during the 61 years it has been building bending machines, acquired a vast store of "know-how" about bending. The machine shown here is the largest rotary bender ever built. It bends on 18" O.D. x .875 wall pressure tube cold 180° in just 3 minutes.

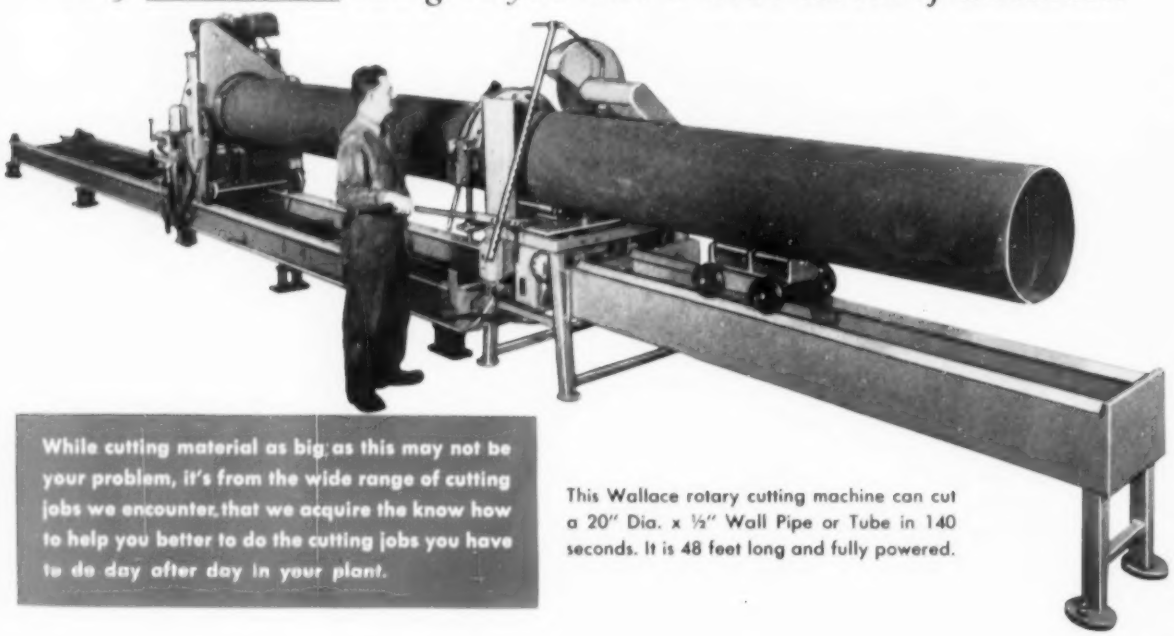
You may not need any of the experience we gain from building machines of this size. But over all these years, we have made about every type of bender you can conceive of.

Bring your bending jobs to Wallace. Let us match our know-how to the work you have to do.

**FREE:** *34-page book on bending. Write today for your personalized copy. Builders of bending and cutting machines "Since 1896".*




***If you BEND or CUT any of these shapes in metal, WALLACE and only WALLACE can give you such a wide choice of machines.***



**While cutting material as big as this may not be your problem, it's from the wide range of cutting jobs we encounter, that we acquire the know how to help you better to do the cutting jobs you have to do day after day in your plant.**

This Wallace rotary cutting machine can cut a 20" Dia. x ½" Wall Pipe or Tube in 140 seconds. It is 48 feet long and fully powered.

*WRITE TODAY. FREE 44 PAGE BOOK — WALLACE "CUT-MACHINING" UNITS.*

## WALLACE SUPPLIES MFG. CO.

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# PROGRESS IN PRODUCTION

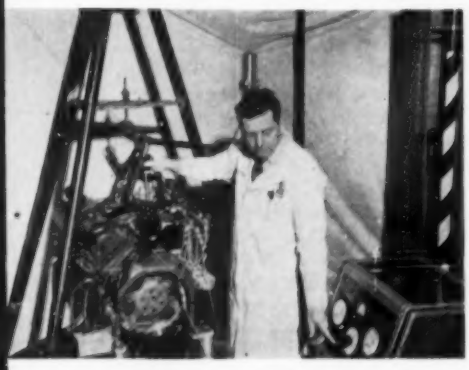
## ELECTRONIC TOOL SEEKS AND CORRECTS UNBALANCE

Quality control of GM's auto assembly lines is expedited by an electronic device for detecting and correcting unbalance to exceptionally low limits. The tool, known as the General Motors Research Pulse Synchronized Unbalance Indicator, accomplishes its work by actually taking the engine's "pulse" at any running speed.

Mounted in a control cabinet, the unit is capable of detecting both amount and location of any engine unbalance, either at the flywheel or the fanbelt pulley at the front end of the crankshaft.

When an engine reaches the end of the assembly line, it is put on a stand for its final "hot" test. Seismic magnetic pickups at each end of the engine detect unbalance. Location of the unbalance is determined from timing or synchronized pulses from the engine ignition. When the engine gets its final run-in adjustments at various throttle settings, the operator of the new PSUI unit simply checks two pairs of dials on an instrument panel. Each set of dials informs him simultaneously both the amount and location or angle of unbalance at either or both ends of the engine. Both the flywheel and fanbelt pulley have evenly spaced holes near their outer rims to permit small weights to be riveted to counteract any unbalance.

**At any running speed, the Pulse Synchonized Unbalance Indicator, developed by General Motors Research Staff, takes an engine's "pulse" so that unbalance can be corrected both at the flywheel (as shown in the photo) or the fanbelt pulley wheel at the front of the engine unit.**



Although each rotating part of a GM auto engine is balanced before an engine is assembled, the complete engine receives an overall balance to cancel out any stacking of unbalance by its individual rotating parts.

The detection routine for the entire engine is considerably simplified by the new device. Among other advantages, it can be installed at the end of a production line where each engine is mounted on a simple test stand for final run-in.

According to Thomas C. Van Degrift, head of the Research Staff's Special problems department, the electronic balancer provides an improved quality partly because of the deletion of other rotating equipment that was required on earlier balancing machines.

The same technique of electronic balancing appears feasible for other specialized balancing problems of individual engine parts.

## ULTRA HIGH FREQUENCY POWERS MINUTE DRILL

Microscopic holes are being drilled in very hard ferrite materials at Lockheed Missile Systems with a special drill powered by silent sound waves.

An oscillator puts out a frequency of 28,000 cps (twice as high as the human ear can detect), which is amplified to produce current to drive the drill with a jack-hammer type of action. The rapid cycling of the frequency causes a magnetostrictive effect. Repeated jarring of the drill against the bit provides the jack-hammer action. The brass drill bit, tipped with diamond paste abrasive, jiggles loosely in the drill to allow even cutting.



**Research lab analyst wears magnifying glasses to watch tiny drill make holes measuring only 0.005 inch in the ultra hard ferrite cores.**

The ferrites, man-made ceramic magnets nearly as hard as diamond, are

# HOW TO BEND
## BARS and TUBING



**HOW TO BEND . . .**
**OFF CENTER EYES**



1. Insert bar stock between Locking Pin and Radius Pin of desired size.



2. Set Forming Roller against material and advance Operating Arm.



3. Complete operation with one steady movement.

**HOW TO BEND . . .**



**TUBING**



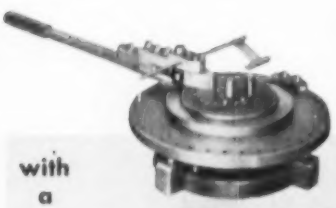
1. Clamp tube. Insert Follow Block between material and Forming Roller.



2. Advance Operating Arm until it strikes Angle Stop.



3. Remove Follow Block, release clamp and remove tube.



with a

# DI-ACRO BENDER

Complete details on forming rods and tubing with standard accessories as well as tips and technical data on angle, channel and other materials will be found in "It's Easy to Bend", a 32 page summary of Di-Acro Benders and bending. A copy is yours free of charge.

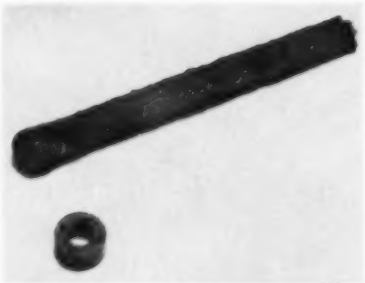
Consult the yellow pages of your phone book for the name of your nearest Di-Acro distributor or write:

pronounced die-ack-ro

**O'NEIL-IRWIN MFG. CO.**
375 8th Ave., Lake City, Minn.

di-acro PRECISION METALWORKING MACHINES

INDICATE A-9-150

**Ultrasonic drill produces precise holes in these cores no larger than the head of a common paper match.**

electronic computers and data storage devices. The cores are ring-shaped, with faces measuring only 0.0045 inch. In these core faces, holes as small as 0.005 inch.

The drill was devised for the precision missile work by Nicholas K. Marshall, senior scientist at the division's research and development center in Palo Alto, Calif. Previous attempts with special steel drills failed as the steel bits curled from heat or ground off their own cutting edges. With the silent sound method, clean cut, accurate holes can be made in a few minutes.

## TELEVISION AIDS DIE PRODUCTION

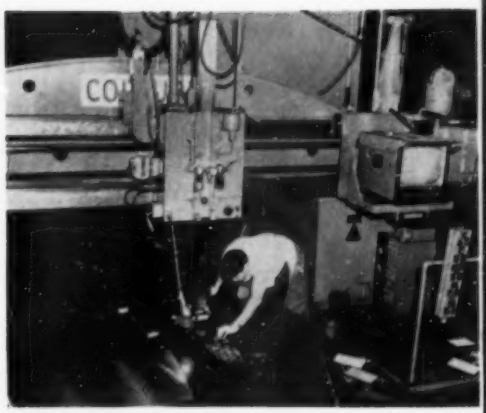
Huge dies are being produced with extreme precision with the help of television at Aluminum Co. of America's Cleveland works. A 17-inch receiving set is built into the control platform of the die layout machine and flashes pictures beamed by three cameras that are trained on finely calibrated scales. Thus the operator can check to a thousandth of an inch the machine's position as it locates dimension points on a hardened steel die block.

As a consequence, dies so large as to have been considered impossible a few years ago, can be produced to precise tolerances.

The die layout machine, considered first of its kind, was developed by Alcoa and Consolidated Machine Tool Div. of Farrel-Birmingham, Inc. to simplify a painstaking, manual operation.

As it lays out the dimensions of a proposed aluminum forging on the face of a steel die block, the machine can move in three directions. Television cameras, installed to focus on three vernier scales, constantly track the position of the machine's scriber as it slowly moves across the surface of the die blocks. These blocks reach as wide as 10 ft, as long as 22 ft and as much as 3 ft thick.

Images, magnified to 10 times actual size, are transmitted to the receiving set on the operator's platform. There,



**Die block for 50-ton die is shown in place ready to be laid out with the aid of television checks. The unusual die-layout machine has many applications including layout out and checking templates used to hog out die blocks.**

the operator checks each of three channels in turn and quickly spots longitudinal, vertical and transverse position of the scriber. Frequent checks aid him as he lays out lines with precision that later guide a cutting tool during the actual die sinking.

## TUBE MILL EMPLOYS ULTRAMODERN EQUIPMENT

When the completely mechanized seamless steel tube mill of Mannesmann Tube Co., Ltd. rolled into production recently at Sault Ste. Marie, Ontario, it introduced the process to industrial automation. The $20-million mill, which is a subsidiary of Germany's largest steel organization, will produce seamless tubes from steel rounds in a push button operation at the rate of 225,000 tons of tubes annually.

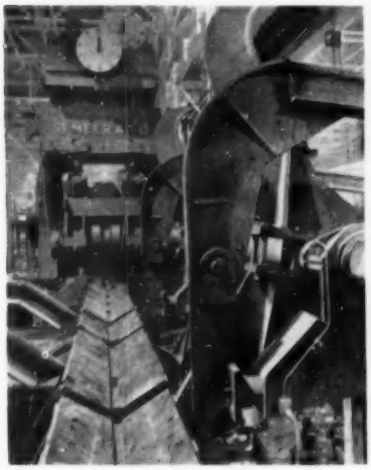
After billets reach the mill, oxygen-electric torches cut them to proper length, predetermined by a formula based on necessary billet weight in relation to the finished tube. When they have been inspected, the billets are heated in a rotary hearth furnace to about 2250 F and passed to a rotary piercer. In the piercer, the billet is advanced by a cross rolling action which creates conditions that cause the hot steel to separate inwardly and form a center cavity. A piercing plug forms the inner surface of the cavity.

Repetition in a second piercing mill elongates the hollow bloom and reduces wall thickness. The still hot tube is then rolled twice in the "plug mill" between grooved rolls over a plug to reduce the wall to desired thickness. Improved design of this modern plug mill results in higher operating speeds than previously obtained.

For dimensional accuracy, the tube

passes through a reeler, and, subsequently, a sizing mill produces an even outside diameter. It is cooled and passed to a rotary straightener. Following various inspections, it is trimmed and cut to the proper length, then transmitted to threading machines. Diameter, wall thickness, concentricity, end finish, surface, straightness and weight are checked and recorded electronically. An automatic hydrostatic pressure test completes the inspection.

Although individual operations inherent in the automatic mill process have not been altered, new types of machinery to accomplish the work have been developed. The principle of the Mannesmann piercer has been adhered to, for example, but higher horsepower

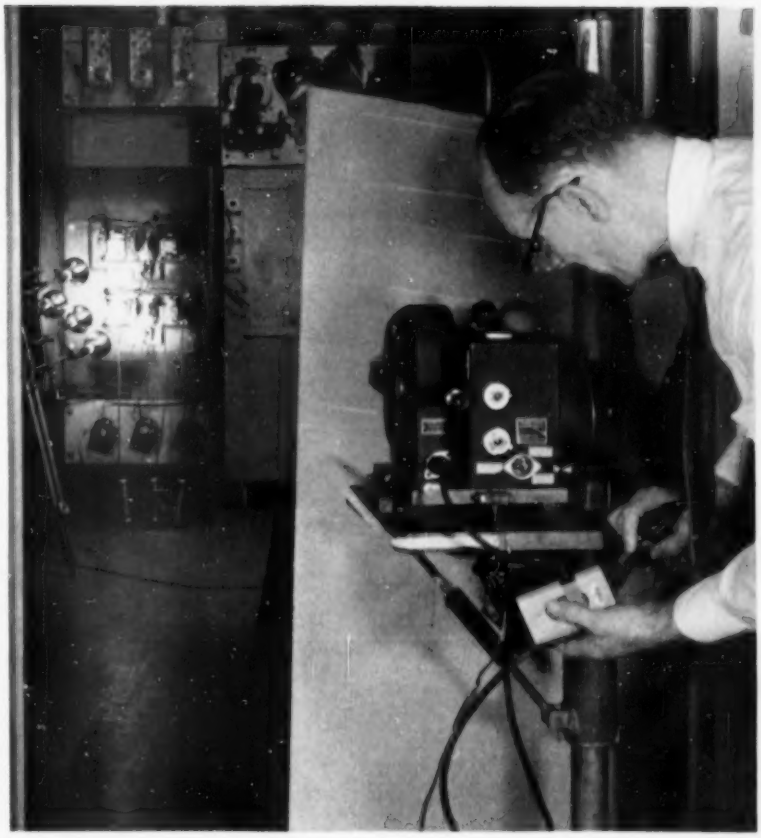


**In this plug mill for the automatic tube plant, radically new design permits exact achievement of specified pipe wall thicknesses at higher operating speeds than previously possible.**

has been attained for the size range of the mill, and the circumferential speed of the rolls has been increased to 1200 fpm.

To provide automation for the mill, fire eyes have been located to register the heat through mathematically spaced holes; that heat creates the automatic reaction which guides and propels the pipe to its next operation. Similar heat created impulses make sure the way is clear by initiating the action in the step ahead.

According to Dr. Gerhard Wagner, president of Mannesmann Tube Co., Ltd., greatest innovation in the mill is the plug mill itself. With the newer single groove rolls, each roll is individually driven by a 2000 hp d-c motor. This permits each rolling pass to be started at the standard rolling speed, and the speed to be increased during rolling. For a 50-ft long pipe, company engineers calculate an average time gain of 0.9 sec per pass.

# What happens to mechanical parts under 5000-ampere surge?

There are techniques for measuring what happens electrically. But, what happens mechanically usually happens too quickly for the eye to catch.

The Milwaukee laboratories of Cutler-Hammer, Inc., use a Kodak High Speed Camera to solve such problems. Taking movies at speeds up to 3200 frames per second, the engineers capture on film the rapid sequence of events coincident with surge current. When the films are projected at normal speed, the action is slowed as much as 200 times. By studying the films, the engineers have been able to make improvements in the product, such as increased speed of response, higher ratings, better protection against motor burnouts under short-circuit conditions, and so on.

It's as simple as this: if your product or process moves too fast to see, slow the action down with high speed movies. Then you can often find the solution to product design and performance problems without tedious cut-and-try experimentation.

To see how others have used the Kodak High Speed Camera, to learn how it can work for you, write for the booklet, "High Speed Movies at the Service of the Engineer."

**EASTMAN KODAK COMPANY, Rochester 4, N. Y.**

**the Kodak *HIGH SPEED* Camera**

Kodak
TRADE MARK

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# V-R TOOLHOLDERS

## . . . a complete line to meet your requirements

**FOR STRAIGHT TURNING**
with triangular inserts



Negative Rake  Negative Rake  Positive Rake

**FOR 15° LEAD ANGLE TURNING AND PROFILING**
with triangular inserts



Negative Rake  Negative Rake  Positive Rake

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with triangular inserts



Negative Rake  Negative Rake  Positive Rake

**FOR 45° LEAD ANGLE TURNING AND PROFILING**
with triangular inserts



Negative Rake  Negative Rake  Positive Rake

**FOR STRAIGHT FACING**
with triangular inserts



Negative Rake  Negative Rake  Positive Rake

**FOR 15° LEAD ANGLE TURNING**
with square inserts



Negative Rake  Negative Rake  Positive Rake

**FOR OFFSET TURNING**
with triangular inserts



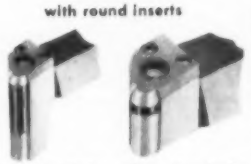
Negative Rake  Positive Rake

**FOR 15° LEAD ANGLE FACING**
with square inserts



Negative Rake  Negative Rake  Positive Rake

**FOR STRAIGHT TURNING AND PROFILING**
with round inserts



Negative Rake  Negative Rake

**All V-R toolholders available in right and left hand styles. Right hand illustrated.**

With V-R throw-away insert toolholders you eliminate carbide grinding. With V-R long head toolholders, you can use any insert up to 1½" length—and you regrind the insert until you have consumed up to 90% of its length. You reduce downtime because you change only the insert, not the tool, when a cutting edge is worn. Inserts are quickly and easily indexed or changed. There is nothing to fall out or fumble with.

Let your V-R qualified field service engineer show you the economies of tooling with V-R toolholders and inserts. Call him today, or write.

**JUST OFF THE PRESS—**
**NEW TOOLHOLDER MANUAL**

*This completely new, comprehensive 52-page technical manual tells you how to select and apply V-R toolholders.*

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*MANUFACTURERS OF:*
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

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**Vascoloy-Ramet Corporation**

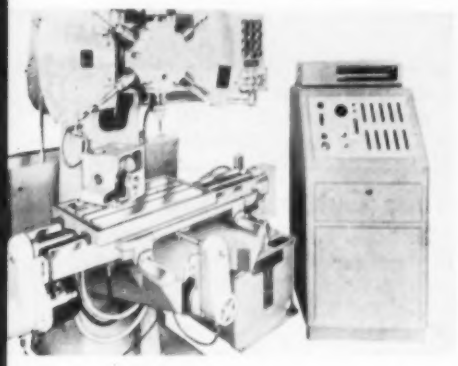
SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

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# TOOLS *of today*

## Two Axis Positioning Table

Automatic tape controlled positioning table is available as an accessory to the Burgmaster multiple spindle turret drill, giving the drill facility both in prototype and production operation. Each spindle is controlled individually by the standard tool in speed, feed, and precision depth control, rapid approach and return. Selection of the 6 (Model 2BH) or 8 (Model 3BH) spindles and table position is programmed on the tape. The unattended system then operates through complex cycle of drilling, tapping, reaming, boring accurately and quickly.



The two axis positioning table is made up of a tape reader and command unit, a comparison unit, servo control and table drive unit, digitizer, display and positioning table. The control provides positive position measurement of machine position instead of counting. This assures accurate control without accumulative errors. After the table is fastened to the machine there is no need for rereferencing the system. Display of machine position is in direct reading decimal form to 0.001 in. The table can be moved either by the motor control switch on the console or the hand wheel on the table. The spindle is advanced by the "Sequence Advance" button. There is direct read out of *X* and *Y* position and the active spindle is displayed. Manual control operations can be accurately interspersed with the tape program. The tape and system can be checked easily and accurately utilizing the display readout, both before the first part is machined and during an operating cycle.

The positioning table has 12 x 22 in. surface with 10 x 18 in. travel. Maximum clearance from spindle nose to table is 18 in. There are two T slots, a key way and coolant trough. Air clamps lock table and saddle automatically at each position. Rapid traverse equals 100 ipm. The table positions at 10 ipm.

Burg Tool Mfg. Co., Inc., Gardena, Calif. **T-9-1**

## Electronic Gage

This electronic gage, designated the Versachek, converts minute differences in established dimensions into voltage changes and amplifies them by means of electronic circuitry for reading on a meter scale. A basic Versachek unit consists of electronic amplifier and pickup head, mounted on either a height gage stand or comparator stand. Gaging is accomplished by setting the Versachek gage head to a specific dimension by means of gage blocks or other suitable master and comparing actual product dimensions, reading the variance from the master on the meter scale.

There are four magnifications available on the standard unit: 400:1, 2000:1, 4000:1, and 20,000:1. Range is selected by a switch on the front panel. Other magnifications can be furnished for special applications. The unit has a self-calibrating circuit and there is no need for constant reference to gage blocks.



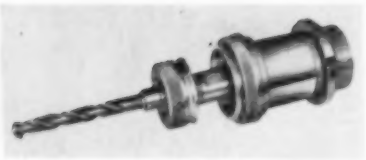
Response is fast. Complete unit can be set up quickly by a single reference to gage blocks or other master; zero is always the same. Operation is simple, and accuracy is not affected by voltage fluctuations. Special pilot lights on the meter indicate the scale in use. The Versachek is portable and can be universally adapted to other devices. Connecting cables can be any length.

Taft-Peirce Mfg. Co., Woonsocket, R. I. **T-9-2**

## Quick-Change Tools

Line of quick-change tools, designed for holding end cutting tools on automatic screw machines have been engineered as both front and rear-removal types to accommodate a broad range of tools and installation requirements. They can be used on any bar or chucking machine.

Because the tools can be replaced in seconds, machines can be operated at optimum efficiency. Resharpened tools are preset in an adapter while the ma-



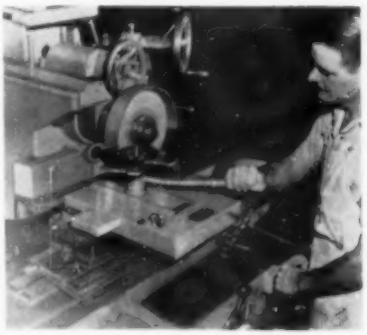
chine continues to produce. Then, when a tool change is required, the tool in the machine is removed and the preset sharp tool is inserted. No in-the-machine adjustment is required.

Scully-Jones and Co., 1916 S. Rockwell St., Chicago 6, Ill. **T-9-3**

## Cam Fabricator

This machine tool, called the Gen-A-Cam precision cam generator, operates on the principle of converting rotational motion to curvi-linear motion by means of a hardened and ground sine bar. With the sine-bar system there is no need for change gears while there is an infinite selection of rate of rise from 0.000 in. per hundredth (dwell) to 0.100 in. per hundredths, or for Swiss cams from 0.000 in. per degree to 0.030 in. per degree.

The tool has been designed so that it can be operated by semiskilled personnel on conventional shop equipment. Precision ground cams can be produced with constant uniform rises having a total clearance of less than 0.002 in. on any total rise and a micro-inch finish on the lobes. With the Gen-A-Cam, two or more rates of rise may be



generated on any lobe permitting optimum rate of feed for any single tool at all times.

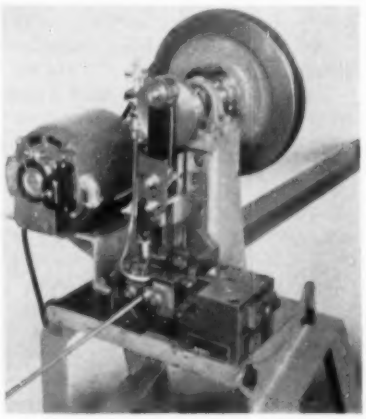
A scribing or layout attachment has also been developed for use with the Gen-A-Cam which makes it possible to layout constant uniform rises by scribing the profile on the cam blank prior to roughing out. The scribing point is made of hardened tool steel and can be used either to cut a deep line or as a center punch in laying out the cam profile.

Steuby Mfg. Co., Machine Tools Div., St. Louis 13, Mo. **T-9-4**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

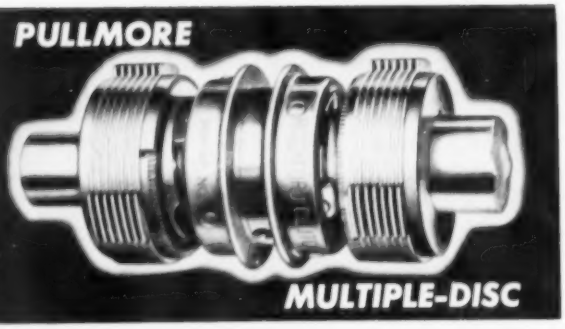
## Tube Cutter

Designed for fast, precision cutting of steel, copper, aluminum and other metal tubing, this machine can be used to cut off tubing of any diameter from ⅛ in. with a maximum wall thickness

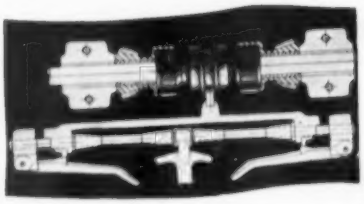



ROCKFORD

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Small Spring Loaded



Heavy Duty Spring Loaded



Oil or Dry Multiple Disc



Heavy Duty Over Center



Power Take-Offs



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COMPACT DESIGN
HIGH TORQUE
HIGH-RATIO LEVERS
POSITIVE NEUTRAL
PRECISION BUILT
LONG WEAR LIFE
EASY ADJUSTMENT

*One-point adjustment, by hand, of ROCKFORD Multiple-Disc CLUTCHES is simple, easy and ample to maintain uniform operating conditions under long, hard usage. Unaffected by centrifugal force, PULLMORE clutches are convenient to operate and are positive in driving, braking and neutral action.

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Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

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Export Sales: Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-154

of 0.028 in. to tubing of ½-in. diam with a maximum wall thickness of 0.045 in. Setup can be easily changed from one diam tubing to another.

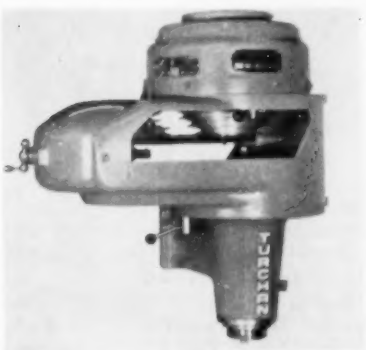
Tubing can be cut off to any predetermined length. For lengths from 2 to 30 in., tubing is cut with the bed of the machine tilted backward, allowing parts to fall into pans. When cutting off longer tubing, the machine can be set level to line up with table or bench, to avoid bending the tubing. After cut off, tubing can be flared without burring.

The machine operates at 245 rpm.

Novi Tool & Machine Co., 25806 Novi Rd., Novi, Mich. **T-9-5**

## Milling Spindle

Equipped with a specially designed belt arrangement, this spindle drive offers a wide range of speed and power. There are no gears, and the belts are easily and quickly removed or adjusted to change speed ratios. Spindle speeds of 130, 195, 300, 460, 705, 1060, 1640 and 2500 are provided. Full horsepower



to the spindle is maintained even on lowest speeds. Belt tension adjustment is simple and convenient and a simple brake arrangement stops and holds the spindle for the fast changing of tools.

Spindle nose is #40 national standard MM taper. Drive is 2 hp, 1200 rpm motor.

Turchan Follower Machine Co., P. O. Box 6055, Dearborn, Mich. **T-9-6**

## Locating Device

A fast, portable electromechanical device is used where jig drilling and reaming is required for precise location of holes to an accuracy of 0.0005 in. Because it does not require dismantling, the tool, called Jigamac, is also used for fixed objects after assembly has been completed. Maximum result can be obtained by an operator after short training time.

Main unit of the tool consists of a 4½ in. circular base housing the centering device in which is placed an internally lighted reticled optical unit. The base has a powerful electromagnetic coil which firmly grips any flat steel surface at any angle. A simple arrangement of wedge shaped eccentrics, turn and lock, one inside the other, to provide compound movement for rapid and easy location. The center of the base is bored to receive the optical unit as well as the bushes.



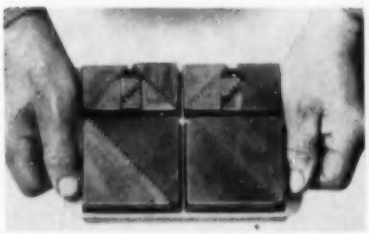
The electrical equipment, which can be plugged into any a-c outlet, is housed in its own compartment in the cabinet. All plugs are noninterchangeable to avoid possibility of accidental transposition.

The unit can be operated from batteries where necessary.

Drilling can be carried out on a machine or with a manually applied portable drill without affecting accuracy of the hole.

Wharton and Wilcocks of America, Inc., 17 Battery Pl., New York 4, N. Y. **T-9-7**

## Step Blocks



Mermod Master Step Blocks are designed for speed while providing precise and rigid setups.

They are made in Switzerland of case-hardened tempered steel. Rounded





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teeth match without danger of slippage. Adjustments can be made in steps of approximately 0.04 in.

Full sets consist of 4 pieces each of blocks with 5, 9, 12 and 23 teeth. Half sets consist of 2 each of the same blocks. All sets are available in widths of 1.77, 2.76 and 3.54 in., and come in aluminum storing trays. Individual pieces also are sold.

Karl A. Neise, 404 Fourth Ave., New York 16, N. Y. **T-9-8**

## Step Drills

These form relief flat step drills can be used on B&S automatic screw machines where clearances are too close to permit use of conventional type holders. The drill fits inside the tool opening of any floating or other type holder.

With the single tool, multiple internal operations can be accomplished on plastics, bronze, brass, copper, aluminum, magnesium and other nonferrous materials on production runs. Drill blades are positively locked yet quickly and easily changed without changing the setup.

B & W Precision Products Co., P. O. Box 3865, Detroit 5, Mich. **T-9-9**

## Chucks

Series 20 ball bearing geared chuck lines, includes gear chucks which have a friction free ball thrust bearing between the chuck body and gear-nut.

With the same key tightening effort, chucks in this series are said to grip with greater force than conventional chucks.

Ball races are formed directly in the hardened chuck body and in the one



piece gear-nut. Simplicity of consiruction and minimum number of parts minimizes maintenance requirements.

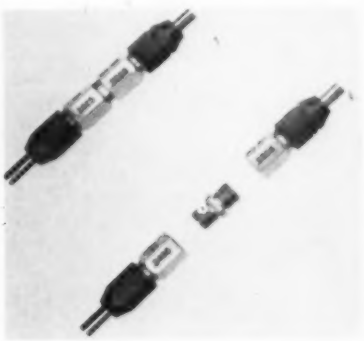
The smooth sleeve prevents snagging of clothing or materials.

Supreme Products Corp., 222 S. Calumet Ave., Chicago 16, Ill. **T-9-10**

## Plug Gage Handle

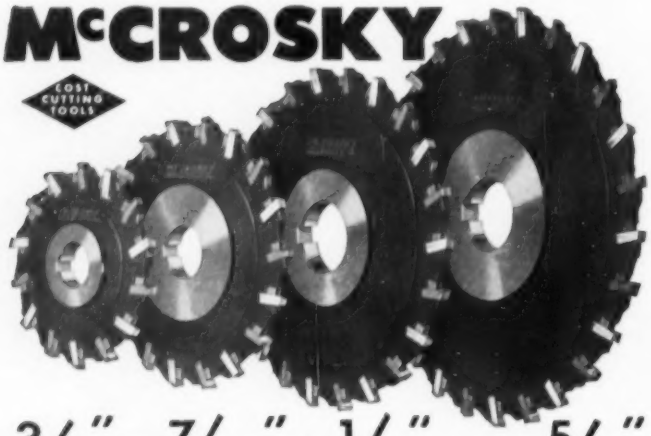
With the VK Duplex handle "go" and "not go" ends of wire type plug gages can be combined for any double end combination in matter of seconds. The handle permits maximum control and flexibility of stocked gages as requirements change.

The members are locked in marked handle units for use as single-end gages




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*Engineering and Sales Representatives in the Principal Cities*
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or combined for double-end use. The original marked data for each gage is in constant evidence for storage, or while being combined with other units.

On completion of a job the ends may be unscrewed from their coupling; and each gage end, complete with its handle and marking, is stored in appropriate numerical order in a gage cabinet or on a gage stock board.

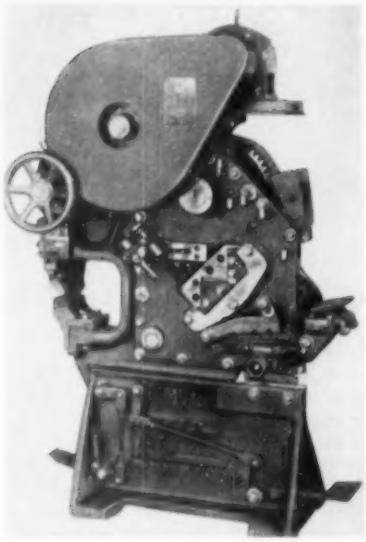
The Van Keuren Co., 176 Waltham St. Watertown, Mass. **T-9-11**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Multipurpose Machine

This combination machine for high-speed punching, shearing and coping punches up to and including $^{13}/_{16}$-in. diameter holes in $^{3}/_{8}$-in. thick steel plate, and up to and including $^{11}/_{16}$-in. holes in $^{1}/_{2}$-in. plate.

It shears up to and including 4 x 4



x $^{1}/_{4}$-in. steel angles, 4 x $^{1}/_{2}$-in. flat bars, $1^{3}/_{8}$-in. round bars, $1^{1}/_{4}$-in. square bars, and $^{3}/_{8}$-in. thick steel plate. It also notches and copes. Larger capacity units also are available.

Joseph T. Ryerson & Son, Inc., Machinery Div., Box 8000-A, Chicago 80, Ill. **T-9-12**

## Die Machining Unit

Designed to machine forge, die cast, blanking, extrusion, embossing dies, this machine, designated the M-501 18 x 43 DieMatic, functions automatically, allowing one man to operate two or more units. Dies are machined after heat treatment, therefore the die openings are not affected by normal heat-


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Improved Lusol, an oil-free transparent water-soluble solution, will give superior performance in a wide variety of grinding operations. The combination of lubricity and maximum cooling make Lusol especially indicated for Centerless Grinders where a fine low micro inch finish is required.

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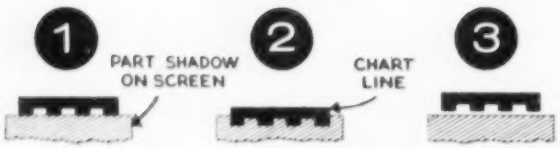
F. E. ANDERSON OIL COMPANY INC.

BOX 213, PORTLAND, CONNECTICUT

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# TEST YOURSELF

## on gaging a split thousandth




(See correct answers below)

This is only *one* type of standard O.G.P. Micro-Gage Chart Line used for quick checking of close tolerances on your optical comparator. Micro-Gage Charts are an optical adaptation of the toolmaker's way of checking his work by comparing it to a straight edge against the light. A crack of light is easy to see . . . much easier than trying to guess whether a part shadow coincides with or falls between parallel lines on a chart. That's why O.G.P. Micro-Gage Charts, printed from precision-scribed masters, permit lower magnification, thus often eliminate costly mechanical shifts in your fixtures. Operators report: (1) Improved accuracy; (2) faster checking; (3) Less indecision. Our experience can help you determine *when* to use Micro-Gage Charts and *which* type will best suit your job.

**EVERYTHING TO MAKE YOUR OPTICAL COMPARATORS MORE USEFUL**

**We also supply all types of standard charts, custom charts, layout accessories, fixture bases, and custom fixtures to meet your specialized requirements.**

*Answers to above test:*

1. Part acceptable. 2. Part oversize. 3. Part undersize.

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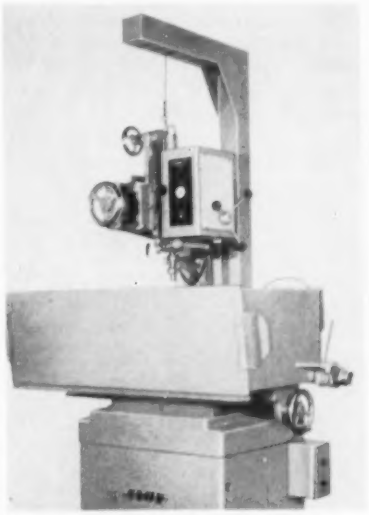

treat distortions. Forge dies can be reworked after washout without removing the entire cavity.

The M-501 DieMatic machines any metal regardless of hardness or density. It also is used to machine soft steels and nonferrous metals.

Machining is done by electrical energy; therefore no force is exerted on the tool to cause a tool to walk or cut untrue, and also avoids burred or feathered edges.

Cutting tools of the DieMatic can be machined, forged, extruded from free machining brass or can be cast from Elo-Met, a low-temperature alloy developed by Elox for this purpose.

The machine has longitudinal travel on the table, cross slide travel on the



overarm, and vertical adjustment on the cross slide assembly for easy adjustment of electrode to workpiece. A high-volume pump is supplied for fast filling of the worktable pan. The coolant filter is mounted on the outside of the machine base, to facilitate change of filter elements. The power supply is a separate unit which can be used on any machine tool that has been adapted for the process.

Elox Corp. of Michigan, 1830 N. Stephenson Hwy., Royal Oak 3, Mich.

**T-9-13**

## Press Control

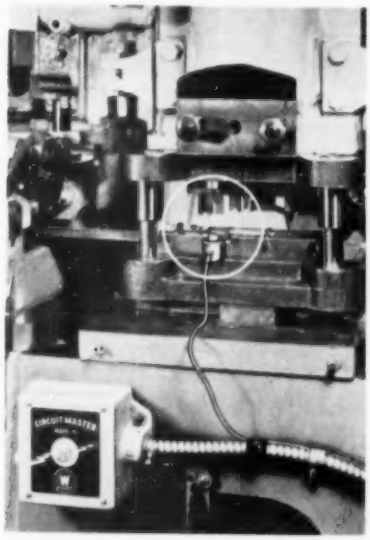
Electronic-mechanical press control prevents tool and die damage caused by mechanical overload.

The device, called the Circuit Master, consists of a mechanical sensing unit and electronic control. On first contact with an overload, the sensing unit sends an impulse to the electronic control unit which in turn relays this impulse to the clutch solenoid, stopping the press immediately. As a result, the en-

tire dies is protected.

A compensator unit is incorporated in the unit which automatically adjusts itself to normal temperature changes, voltage fluctuations and all mechanical changes which occur during the running of an automatic machine.

This Circuit Master Mark II Model RI has been specifically designed for



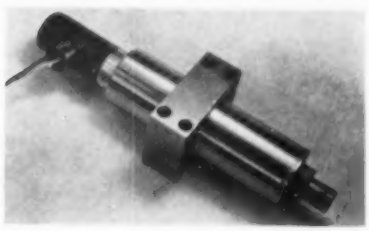
power presses using dies incorporating flattening, forming, coining and similar operations where the closed position of the die is fixed by any of the above operations. Additional sensing units may be added on the same circuit in order to provide added control of auxiliary motions such as material feeds, transfers, etc. Color coded cable, supplied with the device simplifies installation.

Wintriss, Inc., 20 Vandam St., New York 13, N. Y. **T-9-14**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Clamping Package

Simplified complete fixture clamp power package, designated Valve-N-Cylinder, can be used for camping, locating or push-off of parts on production operations. It consists of a non-rotating square rod air cylinder on



which is mounted an electric three-way valve. The compact, fast acting valve, which is easily connected into electrical sequence circuits, may be energized by foot, hand or limit switches. Valve current characteristics are 110 or 220 v, 60 cycles. There is no need for slides or guide rods.

The valve is easily removed from the cylinder, leaving a standard pipe port exposed in the cylinder. Thus the valve and air cylinder may be used separately. The unit can be reassembled in a few minutes. Split block mountings allow adjustment over the length of the cylinder without removing the unit from the fixture. The unit is available with 1, 1½ and 2-in. bores; 1, 2, 3 and 4-in. strokes.

Beckett-Harcum Co., 1087 Wayne Rd., Wilmington, Ohio. **T-9-15**

## Straightener

This 11-roll straightening machine is suitable for work with soft materials while it has additional straightening capacity for steel. Pinch rolls are included at both feed and discharge ends, and the machine is capable of decoiling steel stock in thicknesses from 0.010 to 0.200 in. depending upon width. It will accommodate materials up to 48 in. wide.

Rolls are gear driven. The upper roll train is equipped with a cam-operated quick release to permit easy insertion of stock between the front pinch rolls or allows feed to be instantly halted.

Two matched wedge blocks above opposed roll bearings allow tension to be adjusted uniformly throughout the




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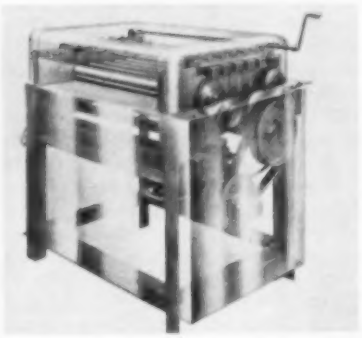
***Results Guaranteed !*** Send samples of finished and unfinished parts to Roto-Finish. Roto-Finish Sample Processing Laboratories will prove to you — before you buy — that Roto-Finishing will give you the results you want. Furthermore, Roto-Finish guarantees to produce the same results in your plant that are achieved in sample processing.



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3726 Milham Rd., Kalamazoo, Mich.

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length of the roll with a single control.

Two models are available: one has constant speed output of 60 fpm; the other has adjustable speed drive producing a feed of 30 to 120 fpm. Worm-gear reduction on the adjustable drive control gives fingertip ease and precise control of rpm.

Benchmaster Mfg. Co., Gardena, Calif. **T-9-15**

## Coining Press

Metal powder parts up to 1½ in. high can be formed on this automatic coining press. Coining takes place in two stages at each stroke of the press. First, the part is positioned in the die by a core pin; then, the upper punch enters the die cavity and coins the part to a pre-determined thickness. A pumpless hydraulic pressure system is provided to achieve uniform density. Load used on each stroke of the press as well as the pressure maintained in the accumulator for the lower ram pressure system are indicated by gages.

Parts are automatically fed from a bowl feeder onto a special track and through an air-operated parts selector into the lower section of the track. An air-operated piston pushes the parts into a stacker magazine from which they escape, one at a time, onto a transfer slide which feeds them over the cavity of



the die. A combination air clutch and brake allows continuous operation and inching as well. All motions of the press are controlled by an adjustable rotary circuit switch.

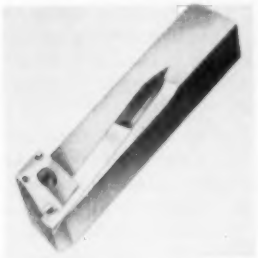
The press has a one-shot central lubrication system, a control cabinet housing all electrical controls, pilot lights, and start and stop pushbuttons. Safety features built into the press include two-hand run-inch pushbuttons, an automatic door interlock which de-energizes the power supply when the safety door across the tool area is opened, and limit switches on all vital parts of the press and feeding mechanism.

The press can be adapted to coin or size almost any variety of metal powder parts at a rate of nearly 1000 pieces an hour.

Haller, Inc., Plymouth, Mich.
**T-9-17**

## Turning Toolholder

Carbide turning toolholder for turret lathes is designed to provide a positive rake, center and chip control. Solid carbide chipbreaker is infinitely adjustable to accommodate any combination of feeds and depths of cut. The tool holder utilizes a solid carbide triangular tool bit, positioned in the holder for positive rake turning; permitting a deep



cut with decreased tool pressures and up to a reported 30 percent horsepower reduction over former tools.

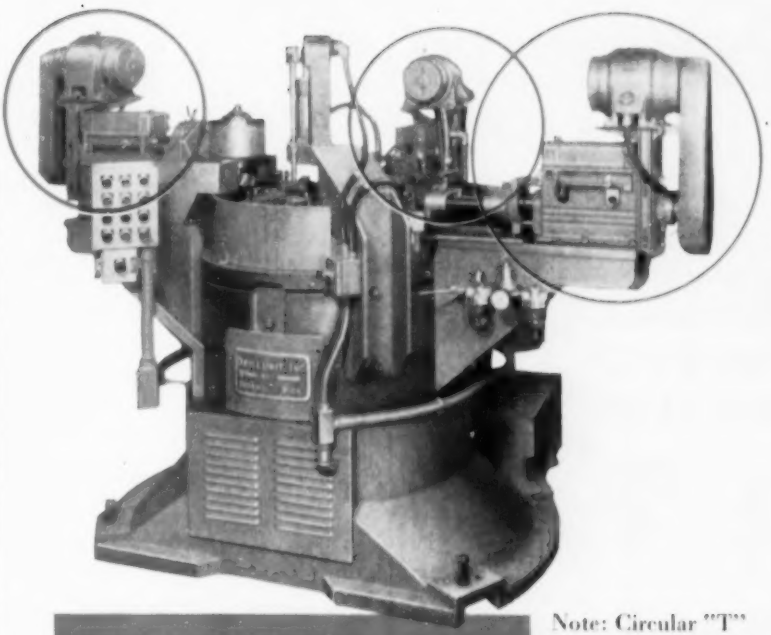
The toolholder has up to two inches reduction on the diameter in one pass. Any nose radius to suit machining requirements and optimum finish is available. The tool permits lead angle or straight to shoulder cutting in one tool.

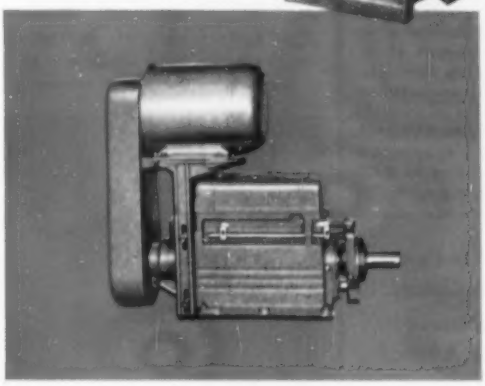
Everede Tool Co., 2000 No. Parkside Ave., Chicago 39, Ill. **T-9-18**

## Cutting Fluids

Two cutting fluids, Jet-Cut No. 9 and Flo-Cut No. 15, were developed for the tough ductile metals such as stainless, boron, titanium steels and difficult-to-machine alloy steels, and are particularly useful in tapping, drilling, milling, hobbing and threading operations.

Jet-Cut No. 9 can be applied directly



Note: Circular "T" slot on periphery of C. I. Base for wing and column adjustment.

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This Drillunit machine is built of a standard base, brackets, columns, table, and the powerful Drillunits outlined in red. Because of this, Drillunit specials never grow old, reconvert at 60% to 80% less cost. Meticulously built by Drillunit of Detroit. Write today.

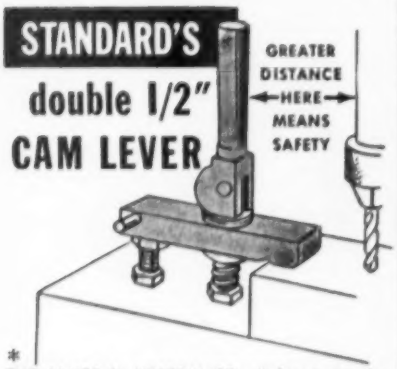
DRILLUNIT

**DRILLUNIT INC., 3267 WIGHT STREET, DETROIT 7, MICH.**
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...up to 3,450 lbs. clamping force

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* THE JAMES H. HERRON CO., (Laboratories for Testing, Analysis and Inspection) reports as follows: "With reference to the Double Cam Lever (500) and Eye-Bolt (500), we have conducted experiments to determine the amount of clamping force a man can exert with this device, lubricated. "Without the use of any auxiliary equipment, it was found that a man could exert up to 3,450 pounds, by bringing the lever to a position 90° with the Eye-Bolt."



*Finger Tip Can Tighten Clamp.*

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- Standard's Double Cam Lever offers maximum job clearance.
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- Certified 6-Ton Back-Pressure Resistance—no danger of cam backing up.
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INDICATE A-9-162-1


as it comes from the can by brush or squirt oiler and may be diluted if the job is not too severe. Flo-Cut No. 15 is formulated for use in circulating, drip, wick, and vapor or mist systems. Both cutting fluids are odorless, contain no irritants, and are nontoxic.

Research Dept., Regal Div., Beloit Tool Corp., Beloit, Wisc. **T-9-19**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Drill Press

Numerical control called Digital Positioning has been applied to this drill press. Digital techniques are used throughout the control system both in the straight-through portion and in the feedback loop.

Electronic components applied to the drill press are readily adaptable to other types of machine tools in which positioning of the work or tool to a given spot is desired. Instructions to the electronic components are given by a punched tape. In machine shown,



work is moved automatically to any square on a ⅛-in. grid within an area of 8 x 16. Holes are drilled at the rate of one per second. The system could be adapted to such modifications as a turret head or a decimal grid of less than 0.001 in.

In the digital positioning system all dimensions are read from a given reference point. Accumulated errors are avoided.

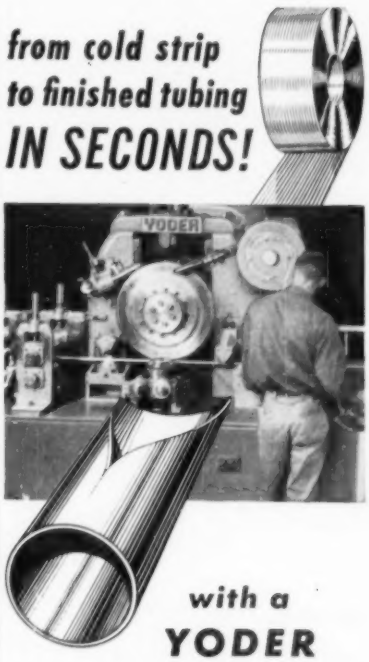
Laboratory for Electronics, Inc., 75 Pitt St., Boston 14, Mass. **T-9-20**

## Automatic Bearing Gages

Standard line of bearing air gages is being supplemented by Sheffield Corp. with an expanding line of fully and semiautomated gaging and assembly machines for all types and sizes of bearings.

Automatic taper roller bearing as-


*from cold strip to finished tubing IN SECONDS!*




*with a* **YODER ELECTRIC-WELD TUBE MILL**

One of the fastest . . . and one of the least expensive . . . methods of making steel tubing is with a Yoder Electric-Weld Tube Mill. The Yoder method eliminates the need for time-consuming heat treatments and costly conditioning furnaces for most tube needs. Scrap losses, too, are far lower than any other method . . . usually less than 2%.

The Yoder Type-M Mill shown above is operated by one man and a helper. Coiled strip on this mill is continuously cold-roll formed, welded and cut to required lengths in a matter of seconds . . . at speeds up to 340 f.p.m. The quality of the resulting tube is *constantly* better than the requirements of commercial standards. This is one of many reasons why manufacturers and users of tubing the world over are using more Yoder mills than all other makes combined.

If your business requires pipe and tubing, ferrous or non-ferrous, in sizes from ¼-inch up to 26-inch diameter, Yoder can supply the engineering service and machines to produce it faster and better for less! For complete details, write for the Yoder Tube Mill Manual. It's yours for the asking.

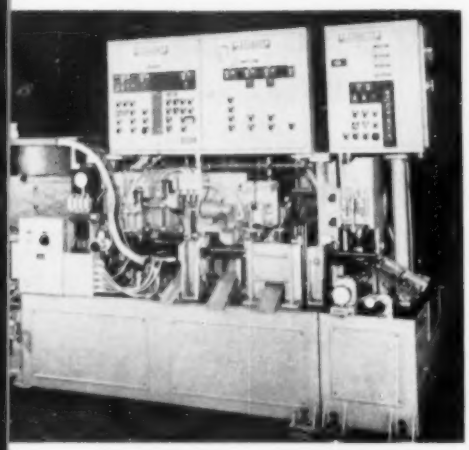
**THE YODER COMPANY**

5525 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

PIPE AND TUBE MILLS (ferrous or non-ferrous)

INDICATE A-9-162-2



sembly machine (illustrated) automatically gages the diameter and flange thickness of the inner race, selects the proper number of rolls from one of six preselected size hoppers and automatically assembles race, rollers and cage into a bearing of predetermined tolerance. The bearing is then checked for torque, standout and noise level and segregated as acceptable or reject.

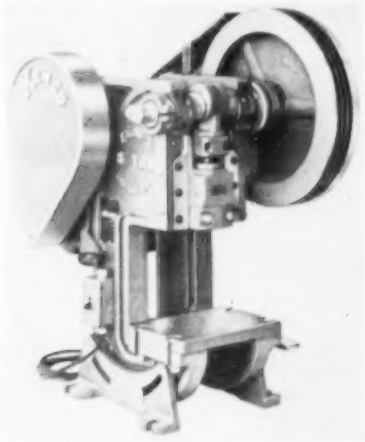
.An automatic radial play Chekmatic gage has an inspection rate of 1,200 parts per hour. Equipped with adjustable tooling, this machine covers a wide range of bearing sizes and automatically segregates, selects and rejects on the basis of radial play measurement.

The Sheffield Corp., Dayton 1, Ohio.

**T-9-21**

## Punch Press

Quiet operation and quickly adjustable working speeds are provided by an 8-ton slow-speed punch press, designed primarily for hand feeding, deep drawing, continuous operation, high-accuracy roll feeding and dial feeding. The press operates at 90 strokes per minute. Other speeds from 50 to 200 strokes per minute are readily obtained




*Scully-Jones Offers*

**PREMIUM CHUCK PERFORMANCE**

**AT NO PREMIUM IN PRICE!**

| These benefits . . . | for these reasons . . | result from these PREMIUM features |
|---|---|---|
| LONGER TOOL LIFE | Breakage reduced | 1. New four-slot design increases resistance to pull-out approximately four times. |
| GREATER ACCURACY | Drills and taps run true | 2. Greater number of slots permits chuck to close evenly on all sides and along shank of tool. |
| | | 3. Bore and shank are concentric within .002", gaged at distance equal to projection of standard jobber-length drill from the chuck. |
| | Accuracy of chuck lasts longer | 4. Hardened alloy steel gives you best combination of spring collet action, high torsional strength, and sustained high accuracy. |
| INCREASED PRODUCTION | Downtime reduced | 5. Improved seating and spring collet action of four-slot design facilitates easy tool changes. |
| | | 6. Four-way gripping action gives you greater protection against drill and tap breakage. |




SCULLY JONES

*Call your Scully-Jones factory-trained representative or distributor for complete information and prices.*

***PRECISION HOLDING TOOLS***

*"Precision Holding" for holding precision*

Scully-Jones and Company, 1915 South Rockwell Street, Chicago 8, Illinois

**for profit-minded tool buyers!**



COUNTERBORES and COUNTERSINKS

Give you rigidity and concentricity needed for accurate work, longer life.



LIVE CENTERS

Take shock and abuse of heavy loads turning at high speeds.



"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes . . . protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.



CENTER DRILL DRIVERS

Offset splined section gives positive drive in drill flutes and protects cutting edges.



DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-163

by changing a single pulley wheel.

Positive belt-drive system transmits power fully and smoothly. The drive mechanism has two flywheels; the first flywheel creates driving momentum, and transmits it to the final drive pulley. The large-diameter final drive pulley overcomes belt slippage problems, transmitting all of the power generated by the initial flywheel by means of multiple high-friction, cog-type dacron belts.

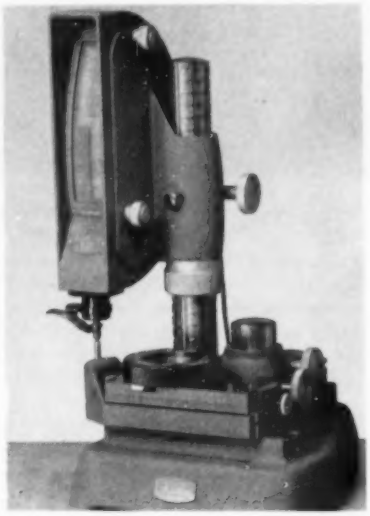
Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif. **T-9-22**

## Internal Comparator Gage

The Leitz internal Tolerator gage is designed for maximum flexibility both in range of diameter and depth of bore. It employs straight line two-point contact method to obtain ID measurement. One measuring jaw is fixed in position and serves for locating the work. The other jaw is a 1:1 bell-crank lever, which is connected to the gaging head. The table on which the work is staged floats on balls and thus becomes self-locating. To determine straightness of bore, taper or bell mouth, the table can be moved vertically by rack and pinion.

The gaging head, same as that used in the Leitz external Tolerator gage, is a semioptical mechanism with a 1000:1 magnification. Reading is visual on an illuminated screen graduated in 0.00005 in. increments.

Bores between ¼ and 3½-in. diam and up to ¾-in. depth may be gaged



by means of two sets of interchangeable jaws. Either a master ring or a snap gage built up from gage blocks serve equally well for setting the gage.

The head may be swung 180 deg to the rear over a standard anvil thus becoming a regular external gage for OD measurements up to 4 in.

Opto-Metri Tools, Inc., 137 Varick St., New York 16, N. Y. **T-9-23**

## Air Drill

Angle-Matic air drill operates in spaces as small as 4 x 4 in., and drills within ½ in. of corners. It has positive power feed and develops up to 300 lb



of thrust. It uses ¼-20 threaded aircraft drills. Features of its design include positive return, an angle head that can be mounted in any of four positions, and ready exchange of air motors of different speeds.

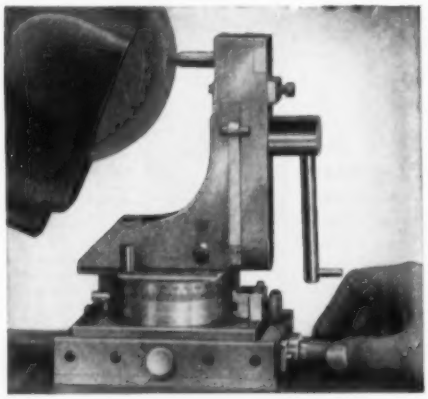
Gardner-Denver Co., Quincy, Ill. **T-9-24**


**Tough Grinding Wheel Forms Dressed Easy as A, B, C**

**eliminate elaborate set-ups and operations**

**.0001" ACCURACY**

*Fluidmotion*
**WHEEL DRESSERS**
dress two angles tangent to a radius in one continuous motion



**With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.**

**Adaptable to all type cylindrical and surface grinders.**

**A. Obtain micrometer reading; add required convex radius or subtract required concave radius.**

**B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.**

**C. Tighten jib. Set stops for two angles. Ready for action.**



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave

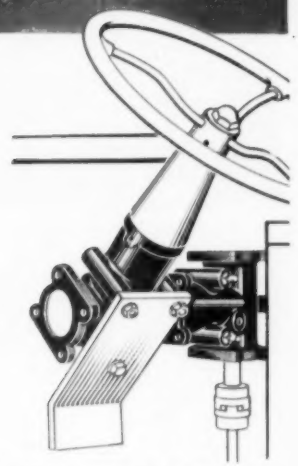
*See your industrial distributor or write for free literature.*

J&S TOOL CO. INC — **CLAMPCUT**

**J & S TOOL CO., INC.** | **880 DORSA AVE. LIVINGSTON, NEW JERSEY**

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# ANGLgear® solves steering linkage problem



Simplified drawing based on photo shows ANGLgears used as steering linkage on John Morrell Co. Mor-Lift fork truck. ANGLgears adapt easily to different steering column angles of various Mor-Lift models.

In designing steering linkage for its Mor-Lift fork trucks, John Morrell Mfg. Co., Elgin, Ill., faced a problem of transmitting rotary motion through two 90° angles. Costwise, standard bevel-gear units were indicated. However, Morrell engineers also needed the design flexibility of custom gearing because of the different steering column angles of various Mor-Lift models.

Two standard 5 hp ANGLgears finally solved the problem. Their compactness and 4-way mounting feature made them easily adaptable to any steering column angle. This eliminated the cost of custom gearing and saved engineering time and expense.

Perhaps ANGLgear can solve a 90° drive problem for you. Designed for manual or power operation, ANGLgears come in ⅓ to 5 hp sizes, with 2- or 3-way shafting and 1:1 or 2:1 gearing.

*See our literature in Sweet's Product Design File or contact your local distributor.*

AIRBORNE®

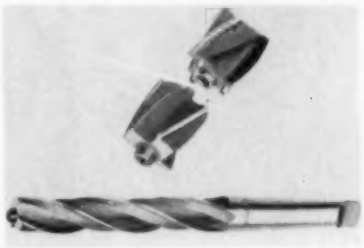
AIRBORNE ACCESSORIES CORPORATION

HILLSIDE 5, NEW JERSEY

INDICATE A-9-165-1


## Three-Flute Core Drill

Pin-mount two-piece core drills, available from stock in 21 small sizes from ¾ to 1⅜ in., consist of a drill body and high-speed or carbide-tipped replaceable cutter which is secured to the body of the drill by an Allen head cap screw. The replaceable tips are accurately positioned on a ground boss



and driven by three pins, one in the center of each flute. Precision ground mating surfaces provide flush fit; there is no gap between body of the tool and cutter section.

The small size tools have deep flutes with adequate chip space for easy disposal. The cutter can be easily removed from holder without taking the tool from spindle. As a consequence of easy removal of the cutter by hand, there are no drift slots, assuring a strong tool body.

Metal Cutting Tools, Inc., Rockford, Ill. **T-9-25**

## Nondestructive Testers

Portable ultrasonic instrument measures thickness from one side as rapidly as a crystal probe is touched to the test surface. It can be used on almost every sound-conducting material to find thin spots in walls, laminations, eccentricity in cored castings and cast-iron pipe, lack of bond, and many other defects.

The unit, called the SO-200, is battery-operated, lightweight, and can be carried easily by means of shoulder straps. It measures thickness from 0.025 to 5.00 in. with only three crys-

**Magnatest FW-400 rod tester**







**FIRMLY BUT GENTLY**

**WITH WOODWORTH CHUCKING EQUIPMENT**

Our tough looking character who is holding the little bird clearly demonstrates one fact: whenever you are holding *anything* it should be secured with gentle firmness. And this is so true when considering chucking equipment.

Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

We invite your inspection and consideration of N. A. Woodworth products. There is a Woodworth Sales Representative in your area and a letter to the N. A. Woodworth Company will place him promptly at your service.

*"Accuracy you can trust"*

**WOODWORTH**

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Detroit 20, Michigan

INDICATE A-9-165-2

*put the f-a-s-t in fastening*

*. . . and improve quality, too . . .*



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**ASSEMBLY MACHINES**

for running nuts and driving screws!



- first in experience
- first in quality
- first in service

Any bolt size . . . any number of spindles . . . maintains desired torque manual or completely automatic operation. Write for an Ingersoll-Rand AIREngineer to survey your needs.

Automatic assembly machine feeds and drives four self tapping screws in three seconds.

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**SO-200 Sonizon unit**

tals. Accuracy is ± 2 percent.

A second nondestructive testing unit, designated FW-400 Magnatest, inspects nonmagnetic rod, tube or wire from 1/64 to 3-in. diameter. Problems such as seams, cracks concentrated porosity, inclusions, stringers, laps and splits may be detected automatically.

When a piece to be inspected is passed through a test coil, a defect shows as a deviation from a straight horizontal line on the indicating scope. When the defective area passes out of the coil, the trace returns to normal. The unit operates on 115-v, 60-cycle, single-phase current.

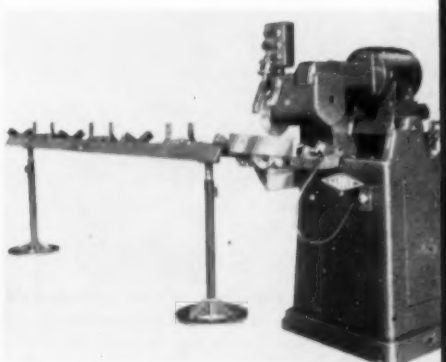
Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 13, Ill. **T-9-26**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Roller Pipe Cutters

A 2B series of pipe and nipple cutting equipment, designed to replace the former No. 2 style cutters, has capacity of ⅛ to 3 in.

Selection of one of three methods of cycling the 2BA (illustrated) air-operated machine (manual, gage or automatic), can be made quickly by set-



ting a selector switch on the electrical control panel. Stroke rate in any type of operation can be regulated to produce up to a maximum of fifty cycles per min.

Foot treadle or hand lever may be used during manual operation. Spindle speeds range from 200 and 240 rpm to efficiently cut all diameters within the machine's range. Gear box lubrication is supplied by a self-contained oil reservoir.

The machine's single alloy steel cutter disk is 8-in. diam., and can be resharpened until a minimum disk diameter of 5 in. is reached before replacement is necessary. A handwheel assembly permits easy size adjustment for cutting different diameters.

Pipe up to 24 in. length can be cut-off by positioning the pipe length gage on the gage rod. The gage is supplied with a ball bearing roller which contacts and rotates with the pipe to minimize gage wear.

Landis Machine Co., Waynesboro, Pa. **T-9-27**

## Testing Device

This portable, manually operated smoke generator provides a means of visually determining behavior of liquids or gases. Smoke from a cigarette serves



as its fuel source. Because of double wall construction, the device is self-cooling.

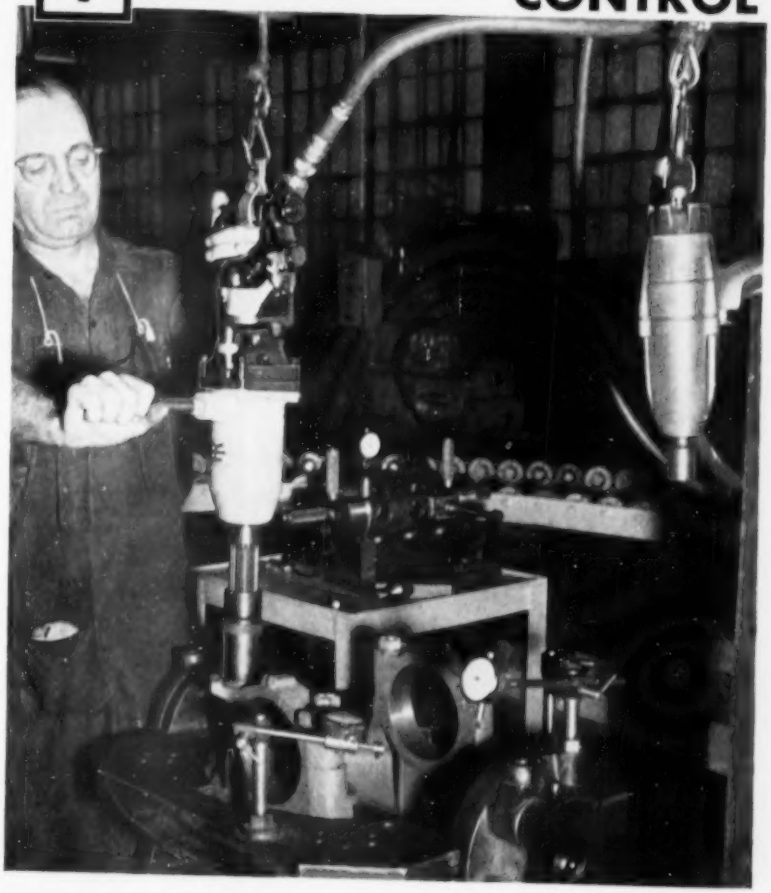
Design Engineers, 214 S. Church St., Rockford, Ill. **T-9-28**

## Tape-Controlled Jig Borer

Development of a tape-controlled Fosmatic jig borer makes use of this equipment practical for small and medium production runs, providing close tolerances without special jigs and fixtures. The machine controls functions ordinarily dependent on the operator's skill. The operator simply loads the part to be machined on the jig borer table, presses a button which positions the table, and sets the spindle speed and feed according to values punched in the tape.

Tapes are prepared in the engineering department where the most efficient


I-R TORSION BAR TORQUE CONTROL



TORQUE CONTROL IMPACTOOLS
consistently run nuts to prescribed torques

I-R Torsion-Bar Impactools now assure top quality control on these 3 operations:

1. *Assembling differential main bearing caps at 450 ft. lbs.* both before and after machining as shown above.
2. *Preloading differential drive pinion bearing* with Impactools set at 375 ft. lbs.
3. *Assembling wheels to wheel hubs at* 425 ft. lbs.

Quality control has risen to a new high for this large manufacturer of farm equipment since I-R Torsion-Bar Torque Control Impactools were installed.

These Impactools are the *only* power wrenches that deliver full power and speed until the preset torque is reached, and then instantly and automatically shut off.

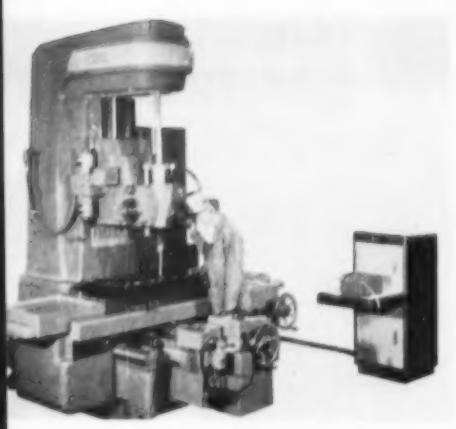
Now, with Torque Control Impactools, the company consistently runs nuts to prescribed torques, saves time, improves quality and eliminates hand torque checking operations.

Write for Bulletin 5170 for proof of how these amazing Impactools can improve quality and cut costs on your own applications.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

8-524

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order of operations is programmed. Dimensions from part prints are punched directly into the tape without the need for coding since a decimal tape punch is used.

Tools are set in the toolroom and numbered according to the operations program. The operator needs only to follow the program.

With the tape-controlled jig borer, scrap is minimized, and there is no need for jigs. Tapes are usually stored so that production runs of the same part can be repeated exactly at later dates.

The measuring system used allows the table to be positioned automatically to tolerances of ± 0.0001 in. For measurements along X and Y coordinates, series of class A measuring gages are lined up. There are 4 gages in even tens of inches, 10 in inches, 10 in tenths of inches and so on down to 0.0001-in. increments. The gages are selected by motor-driven drum dials and positioned end-to-end to provide the required measurements.

The Fosmatic jig borer model 54P provides 16 speeds from 30 to 1800 rpm controlled by electromagnetic clutches. Eight feed rates from 0.0005 to 0.010 ipm can be selected. Table size is 54 x 22 in. Table to spindle capacity is 27½ in.

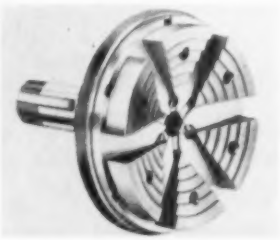
The Fosdick Machine Tool Co., Cincinnati 23, Ohio. **T-9-29**

## Scroll Chuck

A high-precision scroll chuck is equipped with eight jaws to permit clamping the largest possible area of the circumference with minimum pressure. As a result, fragile work is not deformed or crushed.

Removable jaws are available in a variety of styles for internal or external chucking, or they may be had in blank form suitable for machining.

Simple design permits quick and



easy replacement of the shank. Six sizes, from 2 to 6 in., are available to fit all machines and are furnished with or without shanks.

Alina Corp., 122 E. Second St., Mineola, N. Y. **T-9-30**

## Cam Indexed Roll Feeds

These standard high-speed roll feeds are indexed with a roller gear drive to povide repetitive accuracy at rates up to 1,000 strokes a minute. Cam indexing assures positive feeding action without frictional braking. Rolls are connected by helical gearing and little or no slippage is encountered at production speeds.

The roller gear drive consists of a tool steel cam with a tapered rib and a hub with ball or roller bearing followers.

The precision indexing mechanism maintains an accuracy of 0.002 in. or greater, feeding some kinds of material at operating speeds as high as 500 strokes a minute without auxiliary locating methods. Automatic roll separators can be provided to permit the die to perform final locating of the material.

Maintenance and adjustments are minimized because rolls are coupled directly to the output shaft of the roller



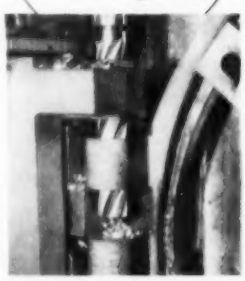

You eliminate 60% WASTE WITH PROVEN METCUT TWO-PIECE CORE DRILLS

**Quick-Change Replaceable Tips Cut Costs, Save Set-Up Time**

Tested and proved over a two-year period, METCUT Pin-Mount Core Drills offer you substantial savings. Now you don't need to throw away 60% of your drills because they are not long enough to get through the bushings and work. You simply buy replacement cutters and re-use the tool bodies over and over again. You also save set-up time because cutters can be quickly and easily changed without re-adjusting spindles. You merely unscrew the retaining cap screw, remove the worn cutter, and place in the new tip. No drifts are required.

**Sturdy Pin-Mount Design, Deep Flutes Equal Solid Drill Performance**

Furthermore, cutting efficiency of the METCUT Core Drill is equal to solid drills. The deep flutes have as much as 60% more chip capacity than ordinary two-piece drills and permit single pass, straight-through drilling on deep holes. Sturdy pins provide accurate alignment and powerful drive. Flush fit eliminates problems of chip lodging or packing.



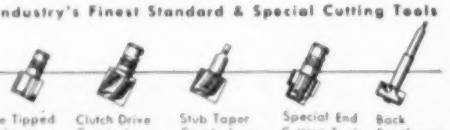
This 1⅛" METCUT Two-Piece Core Drill, used in drilling cast armor steel for a leading tank manufacturer, eliminates 60% tool waste. Replaceable cutters give big savings because 60% of core drill is needed to get cutting edge through the bushings and work.



*WRITE FOR BROCHURE . . . New brochure gives details and specifications on this cost-cutting tool. Ask for quotations. Sizes from ¾" to 5" diameters are now available.*

Industry's Finest Standard & Special Cutting Tools

METCUT



Carbide Tipped Counterbores | Clutch Drive Counterbores | Stub Taper Counterbores | Special End Cutting Tools | Back Spotfacers

METAL CUTTING TOOLS, INC., 325 S. Water St., Rockford, Illinois

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| A-9-37 | American Drill Bushing Co. | Drill Bushings—Catalog contains data on bushings and 3-D method of ordering. (Page 37) |
| A-9-316 | Ampco Metal, Inc. | Materials—Ampco copper-base alloy metal described in Bulletin 33. (Page 316) |
| A-9-157 | F. E. Anderson Oil Co., Inc. | Coolants—16-page booklet describes coolant, dilutions, problems. (Page 157) |
| A-9-216 | Armstrong Bros. Tool Co. | Wrenches—Catalog contains listing of types and sizes for industrial use. (Page 216) |
| A-9-193 | The Atrax Co. | Cutting Tools—96-page "Standard Reference" contains case histories on carbide tooling. (Page 193) |
| A-9-282-1 | Barksdale Valves | Valves—Crescent solenoid valves described in Catalog 6-C. (Page 282) |
| A-9-307 | Boyar Schultz Corp. | Machine Attachments—Engineering specifications described in screw machine tools book. (Page 307) |
| A-9-207 | Brown & Sharpe Mfg. Co. | Cutting Tools—Cutting tools and accessories described in B & S catalog. (Page 207) |
| A-9-230-2 | Carr Lane Mfg. Co. | Fixture Keys—Catalog describes line of mill fixture keys in two styles 8 sizes, plus many other high-production items. (Page 230) |
| A-9-305-3 | Central Safety Equipment Co. | Die Supplies—Bulletin 53 describes Elasticone guide pin covers. (Page 305) |
| A-9-288-2 | Cerro de Pasco Sales Corp. | Materials—Bulletin describes low-temperature melting alloys. (Page 288) |
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| A-9-171-1 | Arthur A. Crafts Co., Inc. | Carbide Form Tools—Catalog available on "Complete Carbide Tooling for Automation." (Page 171) |
| A-9-285 | Crane Packing Co. | Lapping—Folders contain data on production precision flatness. (Page 285) |
| A-9-264-2 | Detroit Stamping Co. | Fixture Components—Clamp-omatic air-operated toggle clamp described in bulletin. (Page 264) |
| A-9-182 | H. E. Dickerman Mfg. Co. | Machine Attachments—Booklets contain data and engineering specifications on complete Dickerman line. (Page 182) |
| A-9-243 | Edlund Machinery Co. | Drilling Machines—Specifications on Model 2F drilling machines contained in Bulletin 140R. (Page 243) |
| A-9-45 | Ex-Cell-O Corp. | Tool Sharpener—Ex-Cell-O Method X tool sharpener described in Bulletin No. 43272. (Page 45) |
| A-9-15 | Federal Products Corp. | Dial Indicators—Catalog 55 details the line of dial indicators. (Pages 14-15) |
| A-9-227 | Hannifin Corp. | Cylinders—Hannifin cylinder file contains data on lines of Hannifin cylinders. (Page 227) |
| A-9-IFC | The Heald Machine Co. | Special Machines—New cam-operated Bore-matic described in Bulletin 2-2215. (Page Ifc) |
| A-9-183 | Heinrich Tools, Inc. | Machine Components—Catalog contains engineering applications of Heinrich Grip-Master vises. (Page 183) |
| A-9-282-3 | The High Standard Mfg. Corp. | Drills—Engineering File "D" gives data on deep-hole drills. (Page 282) |
| A-9-206 | Industrial Filtration Co. | Filters—Bulletin on filtration for industry describes Delpark's micronic filtration. (Page 206) |
| A-9-172 | Kearney & Trecker | Special Machines—Production machine tools Bulletin SMD-57 provides full standard component details. (Page 172) |
| A-9-246-1 | Louis Levin & Son, Inc. | Micro-drill Press—Catalog M describes line of instrument lathes, micro drilling equipment and accessories. (Page 246) |
| A-9-68 | The Lincoln Electric Co. | Welding—Lincoln Idealarc described in Bulletins SB-1343 and SB-1364. (Page 68) |
| A-9-226 | Linde Co. Div. Union Carbide Corp. | Welding—"Modern Methods of Joining Metals" describes Unionmelt Welding, plus other Linde welding methods. (Page 226) |

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## TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

| Literature Number | COMPANY | DESCRIPTION |
|---|---|---|
| A-9-267 | Link Aviation, Inc. | **Measurement**—Bulletin LP-3521 gives engineering specifications on Fringe-count micrometer. (Page 267) |
| A-9-308 | Metal Carbides Corp. | **Metal**—Engineering applications and talide rolls described in Catalog 56-G. (Page 308) |
| A-9-21 | Motch and Merryweather | **Cutting Tools**—M & M's circular sawing handbook provides pocket-size guide to sawing operations. (Page 21) |
| A-9-69 | The National Acme Co. | **Chucking**—Bulletin CM-44 shows 25 different tooling setups on chucking jobs with Acme-Gridley Basic Design. (Page 69) |
| A-9-57 | National Tool Co. | **Tools**—Catalog shows complete line of special tools for the metal-working industry. (Page 57) |
| A-9-302 | C. A. Norgren Co. | **Lubrication**—New 800 catalog describes Norgren micro-Fog. (Page 302) |
| A-9-158 | Optical Gaging Products, Inc. | **Gaging Charts**—Literature shows how to use Micro-gage charts for checking close tolerances on optical comparators. (Page 158) |
| A-9-304-1 | Opto-Metric Tools, Inc. | **Gages**—Catalog 82-177 contains data on tolerator tru-vision comparator gage. (Page 304) |
| A-9-232 | The Osborn Mfg. Co. | **Brushes**—Brushamatic booklet contains engineering data on Osborn power brushing. (Page 232) |
| A-9-314 | Pines Engineering Co., Inc. | **Special Machine**—Booklets contain data on case histories of production bending. (Page 314) |
| A-9-211 | Pratt & Whitney Co., Inc. | **Gages**—Circular 611 describes Pratt & Whitney Jig borer end measures and inside micrometers. (Page 211) |
| A-9-197 | Sandvik Coromant, Div. Sandvik Steel, Inc. | **Cutting Tools**—Catalog contains technical data and engineering specifications. (Page 197) |
| A-9-247 | Simonds Abrasive Co. | **Cutting Wheels**—SA Borolon wheels described in Bulletin ESA 272. (Page 247) |
| A-9-40 | The Skinner Chuck Co. | **Holding Devices**—+GF+ work driver Bulletin gives full information, specifications, and applications. (Page 40) |
| A-9-187 | Standard Die Set Mfrs., Inc. | **Die Supplies**—Booklet "There's a Difference in Die Sets" gives die set comparison chart and engineering details. (Page 187) |
| A-9-233 | The Staples Tool Co. | **Cutting Tools**—Staples precision carbide tools described in catalog. (Page 233) |
| A-9-264-1 | Mac-it Screw Div. Strong, Carlisle & Hammond | **Cap Screws**—"Guide for Design and Assembly of Mac-it Socket Head Cap Screws" gives engineering details. (Page 264) |
| A-9-315 | Super Tool Co. | **Cutting Tools**—New 36-page catalog describes complete Super tool line. (Page 315) |
| A-9-62 | U. S. Tool Co., Inc. | **Special Machines**—Bulletin 15-T gives engineering data on U. S. multi-slides. (Page 62) |
| A-9-252 | The Van Keuren Co. | **Measuring Wires**—Van Keuren catalog and Handbook No. 36 contain technical data and engineering information on measuring problems and methods. (Page 252) |
| A-9-326 | Vlier Engineering, Inc. | **Fixture Components**—Catalog lists Vlier accessories for machine and fixture design. (Page 326) |
| A-9-204 | Wales Strippit Co. | **Hole-Punching**—Bulletin No. 26-H describes Wales horizontal hole punching. (Page 204) |
| A-9-246-4 | Woodson Tool Co. | **Cutting Tools**—Catalog contains engineering details of micro miniatures, small end mills ground from solid. (Page 246) |

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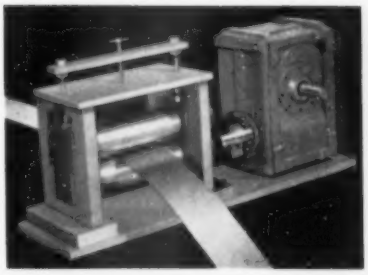
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INDICATE A-9-171-1



gear drive; the indexing mechanism is rated for a minimum of 8,000 hours precision operation.

Standard units are available with strokes between 1 in. or less to 10 in. and rolls up to 12 in. wide. A feed time of either 180 or 270 deg may be chosen with from 2 to 16 stops per one revolution of the rolls.

Ferguson Machine Corp. of Indiana, Roller Gear Div., P. O. Box 5841, St. Louis 21, Mo. **T-9-31**

## Stud Driver-Extractor

This collet type stud driver-remover is designed so that it will not damage studs when either driving or extracting them.

The tool, called the Bi-Way Studder, is immediately ready for hand operation, or to be powered by any standard drive torque unit. It may be reversed without removal from the stud, and collets with which it is used can be changed in less than thirty seconds. Collet sets are available to fit all standard studs to ¾ in. in diam.



E. V. Nielsen, Stamford, Conn. **T-9-32**

## Motor Synchronizer

Synchronous starters with ratings of 2200-4800 v are designed to provide a simple, safe method for starting and bringing synchronous motors into synchronism. A push of the "start" button gives complete protection during starting and running. Throughout the sequence, motor windings are completely protected and automatic synchronization occurs at the most favorable time. Should the motor pull out of step because of voltage dip or overload, the field is automatically removed. Resynchronization occurs when the

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INDICATE A-9-171-2

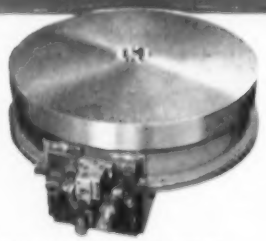


**THIRTEEN STATION AUTOMATIC TRANSFER MACHINE**

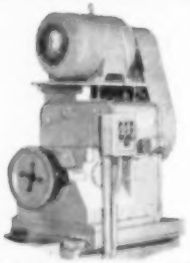
— mills, drills, reams, spotfaces, taps and saws apart cast iron bearing cap blocks. Machine includes 5 standard feed slides, 9 standard production units.

**Because major components are standardized**

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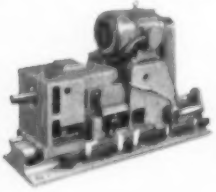
You get IMPORTANT SAVINGS—benefit directly three ways: (1) lower initial cost; (2) less lead time needed and (3) proven standard units mean efficiency *plus* simplified machine maintenance.

Ask the Kearney & Trecker man—he'll show you more examples of standardized machine components in production machine tools — the keys to capturing more profits from production!

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6772 W. National Avenue, Milwaukee 14, Wis.



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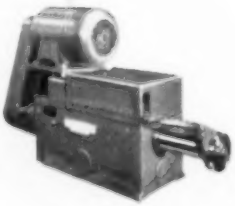


**STANDARD WAY TYPE DRILL UNIT** for drilling, boring, reaming, counter-boring and chamfering. Single and multiple spindle arrangements, single or double feed rates.

**ASK FOR FREE KEARNEY & TRECKER**



Production Machine Tools Bulletin SMD-57. It provides full standard component details — and their application to production machine tools.



**STANDARD QUILL FEED UNIT** for drilling, boring, reaming, spotfacing, counter-boring and chamfering. Single or multiple spindle arrangements — single or double feed rates.

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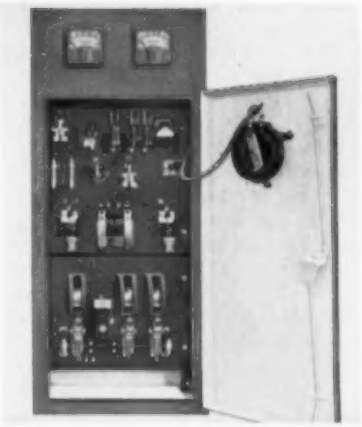
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motor reaccelerates the load. Short circuit protection is provided by current limiting power fuses working in conjunction with high-interrupting capacity ZHA air-break contactor.

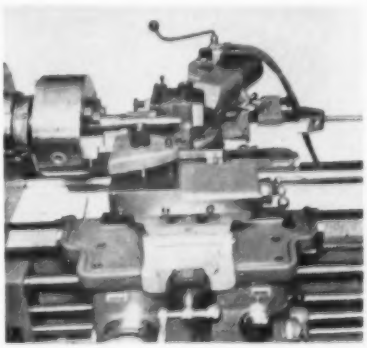
Electric Controller & Mfg. Co., Div. of The Square D Co., 4500 Lee Rd., Cleveland 28, Ohio. **T-9-33**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Copying Attachment

This hydraulic copying attachment, called the Copy-Matic, is designed to fit easily on the rear of the cross slide of any make center lathe without drilling. The turret tool post of the lathe is left free for subsequent operations. With the attachment in place, it is possible to change immediately from copying work to normal turning.

The attachment will produce template profiles with angles up to 90 deg.



Longitudinal and cross positions are registered micrometrically, simplifying setting. A special turret with two quick change toolposts allows turning and facing work without changing the setting. Both approach and return of the toolpost carriage are carried out at fast speed.

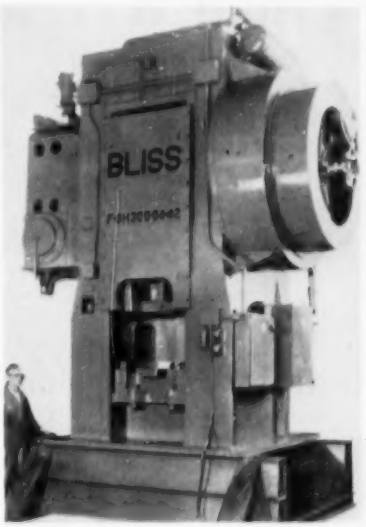
The device, to be shown at the Machine Tool Exhibition at Hanover, has a center height from 6 to 13 in. and will take work up to 20 in. long.

Misal, Via Vittor Pisani, 14, Milan, Italy. Distributed by Misal Machinery Inc., 1 E. 53rd St., New York, N. Y. **T-9-34**

## Forging Press

Design of this high-speed forging press incorporates a tonnage limiter which prevents accidental overloading of the press. It is so constructed that it automatically reduces air pressure on the clutch as the slide approaches the bottom of the stroke, and increases it on the return.

The brake also is redesigned to utilize a double rather than a single clam shell brake. This increases the braking area over former models and, along with




a larger cylinder, has doubled the braking effect.

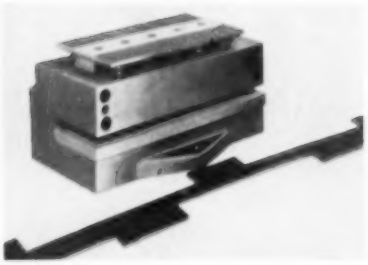
The press now has air counterbalances, air-actuated wedge-type die seat, redesigned flywheel brake and a gear drive for both the limit switch and lubrication pump.

E. W. Bliss Co., Canton, Ohio. **T-9-35**

## Edge Notchers

Line of Unipunch Series A edge-notching units, with 8⅜ in. shut height and 3½ in. die height, are designed and built for setups on templates, T-slotted plates and rails in presses and press brakes. Nothing is attached to press ram.

One or more of the units can be set up to notch one, two or three edges of a sheet simultaneously in practically



any required spacing or along the edge of angles for multiple notches with each stroke of press ram. The punch and die steels are held in alignment by the holder.

The same shut height and die height permits Unipunch Series A edge-notching units and Unipunch Series A perforating units to be combined in the same setup for combining round and shaped hole-punching and nothing in the same operation.

The edge notchers may be mounted on a template outside the press and slid onto the press bed ready to produce parts with the first stroke of the press ram with no aligning, no adjusting and minimum press downtime. The one-piece, high-tensile holder castings have special characteristics to avoid misalignment of punch and die steels.

The edge nothing units are available in 16 standard graduated sizes for notches from 1½ to 1 in. to 3 x 8 in. in material to and including mild steel up to ¼ in. thick. Semistandard notch sizes also available.

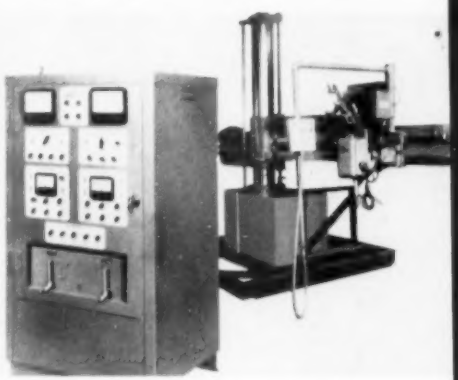
Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y. **T-9-36**

## Fusion Welder Control

A tungsten inert gas fusion welder control, called Weltronarc control, is designed to meet welding requirements encountered in jet engine fabrication and to overcome problems of production welding hard-to-weld alloys.

A console contains: the arc power supply, with up and down slope to eliminate danger of burn-through and craters; the automatic arc length control; the closely regulated wire drive; the closely regulated carriage drive; gas and water controls; and the timer sequence.

Electronic timers in the control are used for sequencing. Arc current and arc voltage are controlled within two



percent. Speed regulation, of both the wire drive and the carriage drive, is held to within less than two percent. Response time of all regulating circuits is 2 cycles.

Infinitely adjustable amplitude and time adjusters operating in voltage regulated circuits provide a wide choice of starting, intermediate and finishing settings for the current, carriage speed and wire speed.

There is stepless electronic control of the arc, from 10 to 400 amp., and automatic protection against absence of either gas or water. Control station provides all jogging movements, and the weld start, emergency stop and manual initiation of current decay on the welding machine.

Weltronic Co., 19500 W. Eight Mile Rd., Detroit 19, Mich. **T-9-37**


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**Hold it...**

**Concentric within .001" with**

**SPEEDGRIP "Cyl-Chucks"**

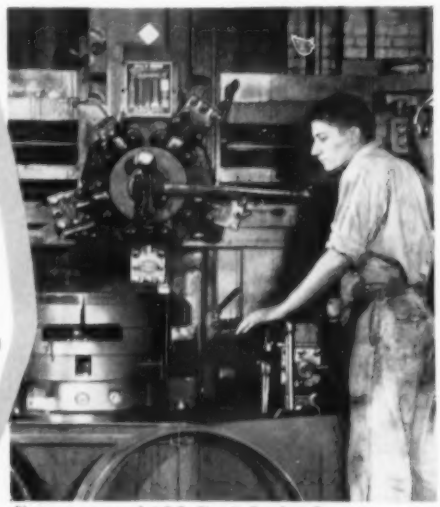


Photo courtesy of I-T-E Circuit Breaker Company

**Self-Contained Production Tools for Holding Jet Engine or Other Thin-Walled Parts**

**SELF-CENTERING "CYL-CHUCKS"**

Designed primarily for second operation chucking on finished or semi-finished surfaces. Hold part concentric within .001" for boring, turning, or grinding operations. IMPROVES QUALITY — INCREASES PRODUCTION UP TO 70%.





**COMPENSATING "CYL-CHUCKS"**

This compensating chuck is made for first operation work to hold rough castings and forgings while boring, turning, or grinding. Special feature provides (12) or more equally spaced, equalized pressure points to practically eliminate distortion.

Sizes 24" to 72"

Write for Bulletin No. 23 for full description and technical details.

**SPEEDGRIP CHUCK**

Division of ERNEST, HOLDEMAN & COLLET, INC.

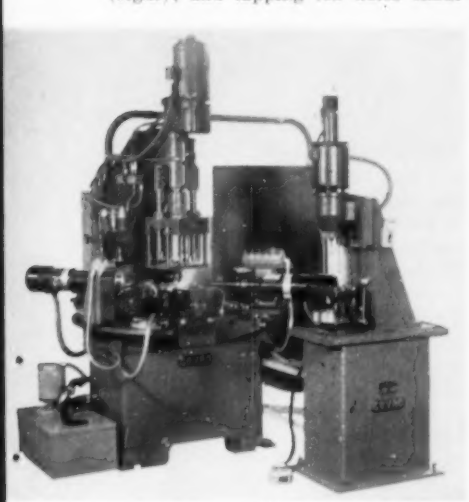
Elkhart, Indiana

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-174

## Dual Machine for Drilling and Tapping

Designed to speed up multiple drilling and tapping operations, this two-position machine incorporates two vertical and five horizontal units for drilling and tapping 12 holes in three similar parts. Two holes are drilled in one position and ten holes are tapped in the second position.

The operator alternately loads the two machines, completing the drilling operations on a manually clamped fixture (right), and tapping ten holes simultaneously on the second machine (left) which automatically clamps, taps and releases the part. Output from the equipment is 300 parts per hour.



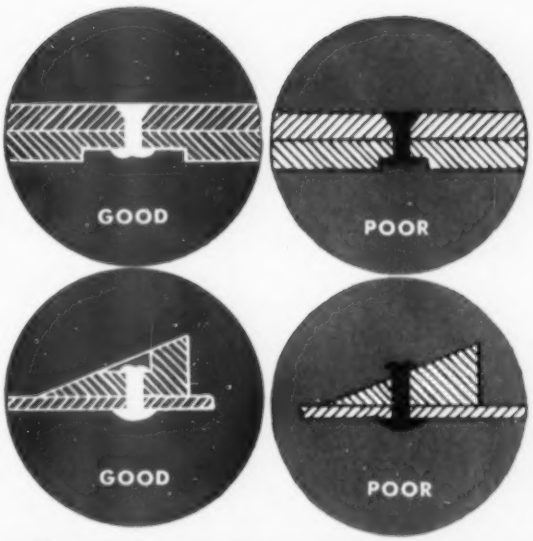
By making changes in the number and arrangements of the units, the machine is readily adaptable to a variety of operations.

Govro-Nelson Co., 1933 Antoinette, Detroit 8, Mich. **T-9-38**

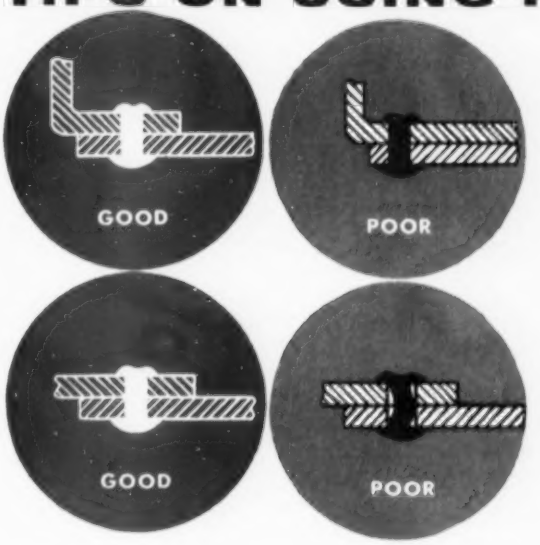
## Gear Gage

Model GRF Red Ring pedestal-type gear gaging, sorting and machine tool control unit for gear production lines can be adapted to check size and helix angle accuracy of spur or helical gears. A model for hobbing machines checks and sorts gears for both size and helix angle accuracy. Another model for gear shapers and shaving machines checks and sorts gears for size accuracy only.

The gaging machine is a standarized Red Ring design which consists of a motorized gaging and sorting unit through which the gears are fed one-at-a-time from an inclined feed chute. Gears that pass inspection travel through the machine into an inclined exit feed chute. The machine is designed to occupy a minimum of floor


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You could memorize these and thousands more design tips on the best use of rivets—but don't! Much simpler to call on Milford for the right answers to all your riveting design and application problems. Full-tubular, semi-tubular, split, cutlery, decorative—Milford makes them all from any metal that can be cold-formed, then adds a wide variety of platings and finishes.

To improve product appearance and strength
. . . to take full advantage of automatic assembly
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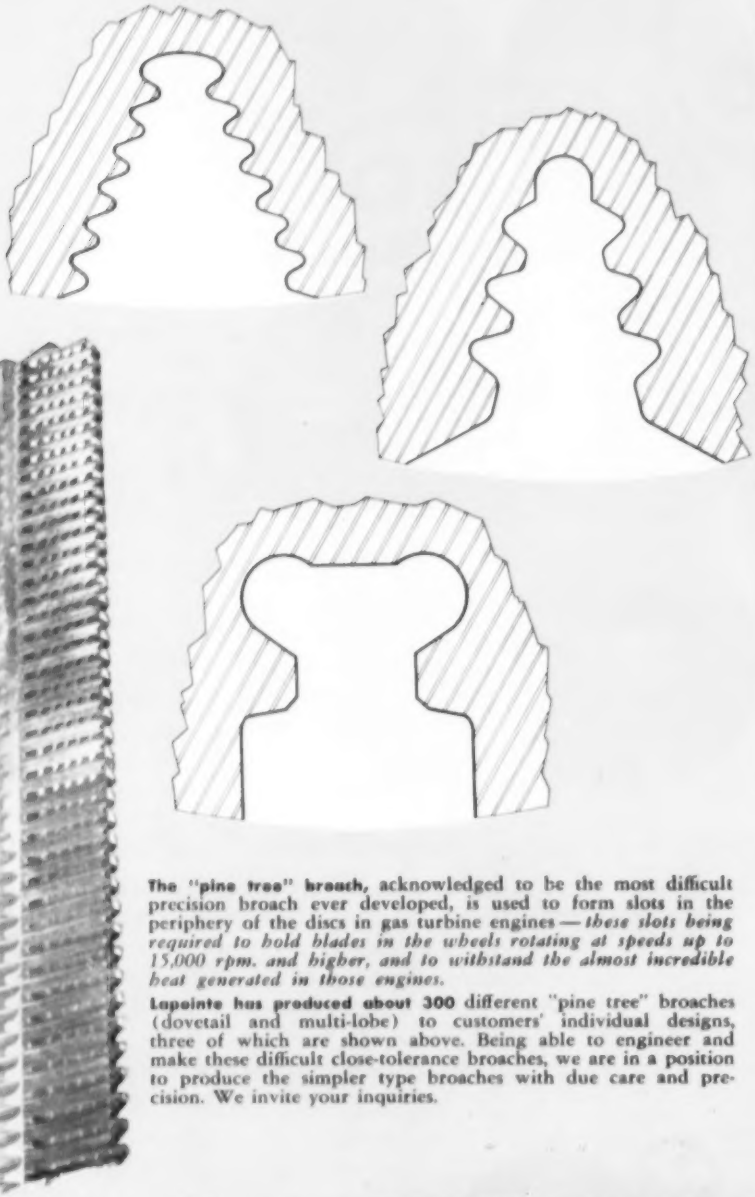
'way back in 1941

( four years before the end of World War II )

LAPOINTE developed the *first*

"pine tree" BROACH

...so that aircraft gas turbine engines could be built in this country.



**The "pine tree" broach,** acknowledged to be the most difficult precision broach ever developed, is used to form slots in the periphery of the discs in gas turbine engines — *these slots being required to hold blades in the wheels rotating at speeds up to 15,000 rpm. and higher, and to withstand the almost incredible heat generated in those engines.*

**Lapointe has produced about 300** different "pine tree" broaches (dovetail and multi-lobe) to customers' individual designs, three of which are shown above. Being able to engineer and make these difficult close-tolerance broaches, we are in a position to produce the simpler type broaches with due care and precision. We invite your inquiries.

LAPOINTE-BROACHES, *Electrolized* increase broach life between grinds from 2 to 10 times.

THE LAPOINTE MACHINE TOOL CO.

HUDSON, MASSACHUSETTS — U. S. A.

In England, Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

LAPOINTE

known to be the best in

BROACHING



space; vertical height is adjustable.

The unit automatically shuts down the gear production machine after a predetermined number of reject parts are detected. It can also be used as a feedback control unit to automatically shift hobs on hobbing machines when measurements indicate dulling of the tool.

National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich. **T-9-39**

## Coolant Systems

Trico-Mist coolant systems are now available with flexible armored tubes to protect plastic air and coolant lines against abuse and damage. This tube is also provided with a substantial fitting that permits easy, quick replacement of the nozzle.

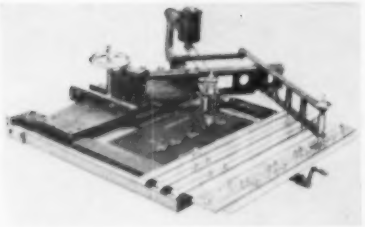
The mist type coolant principle for drilling, tapping, milling, sawing, grinding and other operations results in dissipation of heat by the combined effects of expanding compressed air, evaporation of coolant, and rapid movement of air.

Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis. **T-9-40**

## Engraving Machine

Designed particularly for the electronic and electrical industries, for engraving oversize panels which cannot be accommodated by any other conventional engraving machines, the Engravograph Model I-R also can be used for engraving small work.

The pantograph assembly, motor, and copy table are built as an independent unit on one chassis. Any length panels can be clamped on the machine base and engraved over their entire surface. For larger work, the complete chassis



can be removed from the base and placed anywhere directly on a workpiece of any dimension. Permanent installations can be engraved where they are.

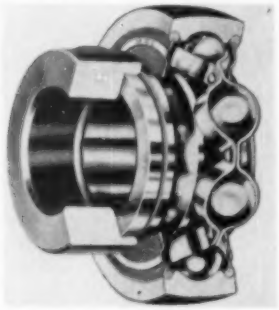
New Hermes Engraving Machine Corp., 13-19 University Pl., New York 3, N. Y. **T-9-41**

## Bearings

Power transmission ball bearings, designated the RA series, prelubricated, require minimum maintenance and are protected against dirt and moisture.

Easy to install, these bearings fit standard pressed steel flangette housings, and the bores will fit commercially ground inch shafting.

A standard eccentric collar is used to lock the bearing firmly to the shaft; there is no need for press fits, lock nuts, or other locking devices. The bearings are made with either a cylindrical or spherical profile or outer ring. The

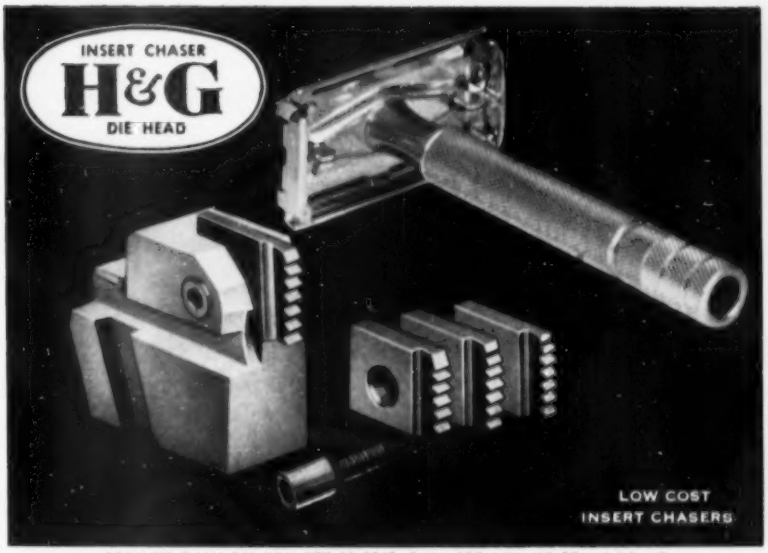


spherical outer ring allows the bearing to adjust itself in a corresponding spherical housing seat, thus permitting reasonable shaft misalignment without damage to the bearing.

Marlin-Rockwell Corp., Jamestown, N. Y. **T-9-42**

## Horizontal Boring Mill

This 2 11/64-in. diam bar, light-duty, Pama Model AL horizontal boring mill incorporates a safety chuck which safeguards the machine against any overfeeding by the operator by disengaging should any feed meet undue resistance. This clutch also may be utilized as a limit stop without fear of machine damage. The gears in the headstock are similarly protected against overloading. The machine has hardened


FOR LESS THAN $45 YOU GET 12 SETS, EACH SET GROUND READY TO GO

*Men would not accept either idea at first . . .*

**INSERT CHASERS SAVE UP TO 33%**

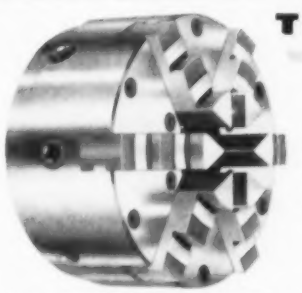
Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $45 you get a dozen sets of ¾—16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "Unified and American Screw Thread Digest"

**THE EASTERN MACHINE SCREW CORPORATION, 27-47 Barclay St., New Haven, Conn.**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-177-1

**Next time you buy scroll chucks . . . get these *Buck* features. They cost no more.**





Dead true precision adjustment *within 1 minute* . . . guaranteed precision of .0005" chucking duplicate parts *without* adjustment . . . compensation for spindle run-out . . . longer lasting accuracy! Production-wise and cost-wise you can't beat Buck Ajust-Tru values.

**MOUNTING PLATES:**

**American Standard A-1 and A-2; Camlock D-1; Long Taper Key Drive Type L; Threaded; plus mountings for grinders and special machines.**

**SIZES:**
4" 5" 6" 7½"
8¼" 9" 10" 12"

Buck Ajust-Tru Chucks were the *first* precision universal scroll chucks and none of the imitations provide all the Buck features that give you quick set-ups and higher production rates. That's why it pays to chuck with Buck.

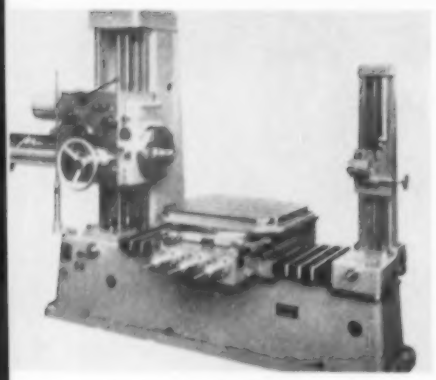
If you aren't thoroughly familiar with the Buck Ajust-Tru patented principle and why it made precision chucking possible with scroll chucks, the catalog will give you full details.

WRITE FOR COMPLETE BUCK CATALOG

**BUCK TOOL COMPANY**

933 SCHIPPERS LANE • KALAMAZOO, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-177-2



and ground gears in the head, built in, rectangular top, and a power driven, rotary table. Ball and roller bearing spindle provides 14 spindle speeds of from 17 to 1500 rpm. Table travel is 26 in. in either direction and is power and rapid traverse controlled. Longitudinal travel of the spindle is 20 in., and spindle may be supplied with a thread attachment.

This machine can also be supplied with power-driven facing head, coolant pump, OPL optical measuring device for the vertical movement of the head, gross movement of the table and traverse of the spindle.

Maserati Corp. of America, 46 Sea Cliff Ave., Glen Cove, N. Y. **T-9-43**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Tapping Head

The No. 17,000 Burgmaster tapping head has positive drive, is ball bearing mounted and provides No. 10½ in. NF tap capacity on the Burgmaster Model 1C turret dill. Housing is cast aluminum. All shafts, gears and chuck are of alloy steel, heat treated and ground. Engagement of forward and reverse is through positive jaw clutches. One rubberflex collet covers the range of the 1C tapper. All taps are tang driven to prevent slipping of tap.

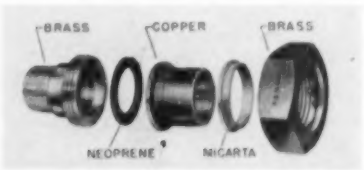



Burg Tool Mfg. Co., Inc., Gardena, Calif. **T-9-44**

## Dielectric Union

Effective insulation from electrolytic action brought about by connecting dissimilar metals is provided by this dielectric union.

The union makes use of both a neoprene gasket and a micarta bushing for safe, positive insulation. Available in both 1¼ and 1½ in. pipe sizes, as well as other sizes in special cases, they withstand pressures to 125 lb and temperatures to 180 deg F. The bodies are machined from heavy brass and copper castings for smooth operation and long life.




Pittsburgh Brass Mfg. Corp., 31st and Penn Ave., Pittsburgh, Pa. **T-9-45**

## Grinding Machine

Continuous lubricating system, timer belt, 110 volt electrical control and close tolerance downfeed control are incorporated in the model VG-3 Visual Grind.

This tool permits form grinding of steel and tungsten carbide to precision tolerances without use of a compara-




looking for a competitive edge?

**Helicarb Cutters give maximum stock removal with finishes of 20 rms and better!**

"Helicarb" Cutters permit optimum use of the new advances in machine tool design. The constant cutting angle over the full flute distributes the chip load uniformly. This shear-like cutting action reduces impact and chatter and removes from 3 to 10 times more metal than straight-tooth carbide cutters. They really pay off where good finish is required since rough and finish cuts can be combined on many jobs.

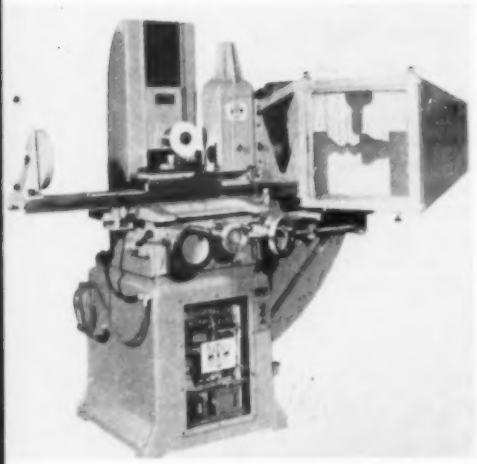
*"ONE PASS" cutters for popular hydraulic parts!*

HELICARB
Trademark
*The competitive edge!*
Manufactured by
Sonnet Tool & Mfg. Co.
672 North Prairie Ave.
Hawthorne, Calif.




*Your "Helicarb" dealer can give you complete information.*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-178



tor. It facilitates continuous grinding and work inspection of intricate forms by through, blind and combination grinding methods.

The workpiece, which is projected on a ground glass viewing screen with magnification systems ranging from 10:1, to 100:1, is ground and simultaneously inspected on the viewing screen enlargement. Downfeed control in the Visual Grind is graduated to tenths.

The continuous lubricating system is a low pressure rotary pump providing a constant film on machine ways.

Nylon oil-protected timer belt assures smooth finish. A 110 volt electrical control operates from 220 or 440 volts.

The Cleveland Grinding Machine Co., 1610 Eddy Rd., Cleveland 12, Ohio.

**T-9-46**

## Speed Reducer

A series of Insco step function speed reducers provides ten repeatable speed ratios up to 1000:1. Any of the ten speeds may be selected by turning the selector knob without stopping the input drive shaft.

Gear drive design assures precise repeatability of speed.

This Insco series is recommended for input speeds up to 2000 rpm and has torque capacity of 50 oz-in. on the output shaft. The unit has parallel ¼-in. input and output shafts and may be panel or base mounted. All four models in the new series are the same size: 4½ x 5 x 5 in.

Speed ratios of Model 00130 are 1, 2, 5, 10, 20, 50, 100, 200, 500 and 1000:1; of Model 00131 are 1, 2.5, 5, 10, 25, 50, 100, 250, 500 and 1000:1; of Model 00132, are 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10:1; and of Model 00133 are 1, 2, 3, 4, 5, 10, 20, 30, 40 and 50:1.

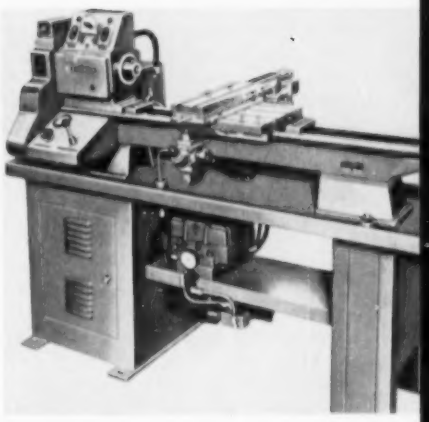
Insco Co., Div. of Barry Controls Inc., Groton, Mass. **T-9-47**

## Turning-Boring Machine

The Hydra-Cycle semiautomatic turning and boring machine performs several machining operations simultaneously or in continuous sequence, to close tolerances. It will do turning, boring, facing, forming, grooving, chamfering, beveling or cutting-off operations economically on both short and long production runs.

Model No. 6405, illustrated, has a hydraulically operated cross slide mounted on a hydraulically operated longitudinal table. Four cycles are available through dial selector on control panel.

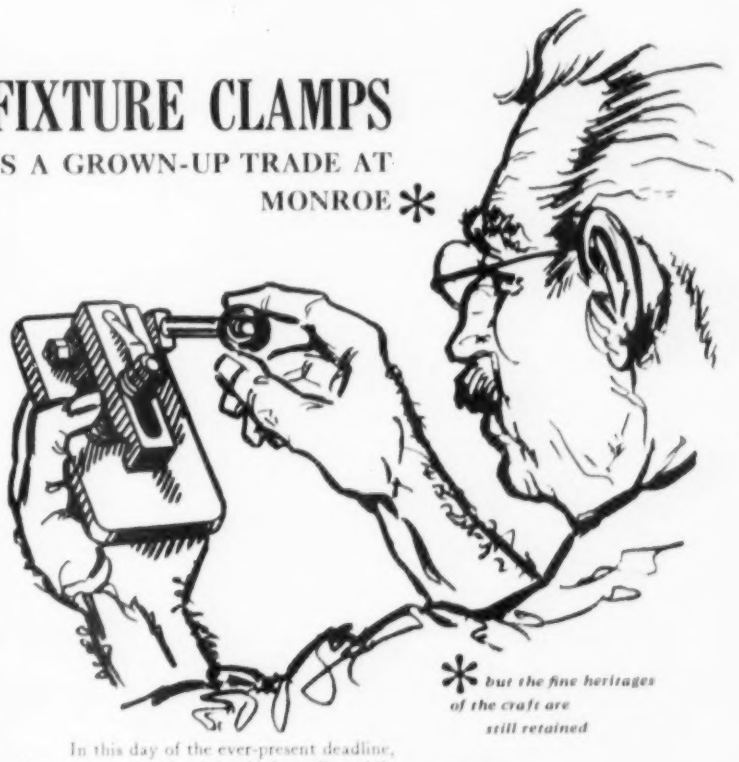
Three other models are available. One has bed mounted cross slide only; another, bed mounted table only; the third, bed mounted cross slide and table.



In all models, the table and cross slide may be set to feed at selected speed for full traverse, to advance at


# FIXTURE CLAMPS

IS A GROWN-UP TRADE AT MONROE *



* *but the fine heritages of the craft are still retained*

In this day of the ever-present deadline, the problem of maintaining high quality while making deliveries on time, plus keeping down costs, is always with us. We've devoted a lot of effort to make sure that our high standards of quality are maintained in the face of the most exacting deadlines. Our simplicity of design is realized through sound engineering by qualified men with years of experience. Realistic proof of these facts is that we are supplying fixture clamps and details for many of the most leading industries in the country.



Fully illustrated catalog offers you accurate full size template of assemblies.

monroe ENGINEERING PRODUCTS INC.

1515 Hurd Road, Monroe, Michigan

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rapid traverse to work and feed to positive stop, or to skip feed. Feed of table and cross slide are infinitely adjustable between 3/16 and 60 in. ipm by valve control. Headstock is enclosed and has pumped bath of oil. The hardened spindle nose is tapered key type L-00, and has 1⅜-in. bore.

The tool has a swing of 12¾ in. overbed, 4 11/16 in. over cross slide when mounted on table (7 in. when cross slide is bed mounted), and 9-in. overtable. Cross slide travel is 5 in. and table travel is 8 in. Cross slide is 5 x 16 in; table, 12 x 14 in. The bed is 59 in. long with 40 in. right of headstock.

Clausing, Div. Atlas Press Co., 21114 N. Pitcher St., Kalamazoo, Mich. **T-9-48**

## Barrel Finishing Compound

A neutral, powdered, nonabrasive compound, called Esbec No. 234, will remove rust, oxide stains, and light heat-treat scale as well as the gray film left after long runs in aluminum oxide chips in preparation for burnishing. It will produce burnishing results in from 15 to 45 min. with small chips of steel burnishing media. The compound also will recondition steel burnishing media, removing films which prevent good results and restoring luster, usually in a 50-min. run.

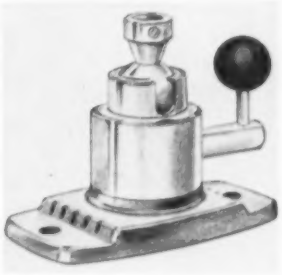
For use, from 2 to 3 oz. of the compound are required per gal. of water.

Esbec Barrel Finishing Corp., 18 Beech St., Byram, Conn. **T-9-49**

## Work Positioner

Universal work positioning fixture, called the Veep PowRarm, can be used with vises or special work holding attachments to move work to any position in all three planes. Because of its small size and compact design, it is useful for small assembly work.

At the end of the shank, there is a ½ in. diameter female socket, equipped with a socket head set screw. This arrangement provides a fast, positive means of attaching work holding fixtures.



Body of the tool is cadmium plated steel. Force is applied by an eccentric on the main shaft. It will support a work load of 15 lb at 6 in. It is 4 x 2¾ x 3¾ in. high, and weighs about 3 lb.

Wilton Tool Mfg. Co., Inc., Schiller Park, Ill. **T-9-50**

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## Reamer Driver

Bench-mounted reamer driver, with capacity for ¼ to 1½-in. diam. reamers, has four speeds: 20, 32, 56 and 85 rpm. Higher speed ranges are available on special order. Foot switch operation leaves the operator's hands free to control the work. Steady, low-speed rotation of the reamer driver assures smoothly reamed holes. Release of pressure on foot switch stops rotation of the chuck at any time.




The tool has a 4-in., four-jaw universal chuck; a three-jaw chuck is offered as optional equipment. Motor


**from**  **to**  **in 9 seconds**

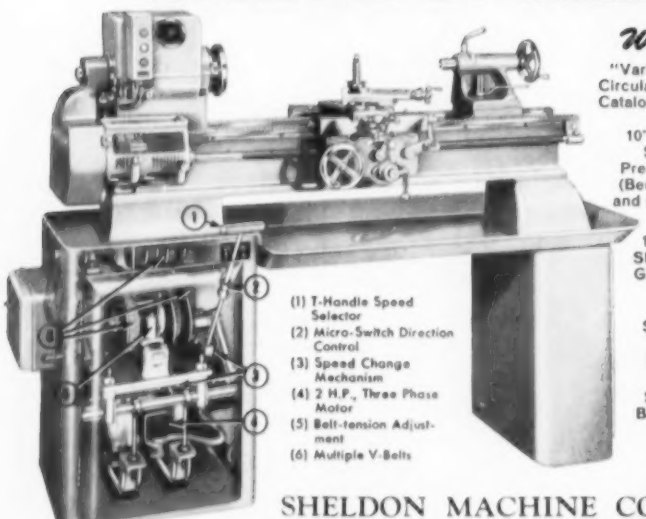
**or to *any* intermediate speed, *instantly***

Just raise or lower the T-handle control, and watch the large tachometer dial in the headstock! It's that easy! The work is done by a power driven speed changer. It accelerates or slows the lathe to any desired speed in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds —200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

**SHELDON** *Variable Speed* **PRECISION LATHES**




*Write for*
"Variable Speed" Circular and General Catalog showing . . .
•
10", 11" and 13" SHELDON Precision Lathes (Bench, Pedestal and Cabinet types)
•
13" and 15" SEBASTIAN Geared Head Lathes
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SHELDON Milling Machines
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SHELDON Back Geared Shapers

SHELDON MACHINE CO., INC.
4229 N. Knox Ave. • Chicago 41, ILL.

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is wired for 110-v-a-c current. Entire mechanism, including motor, is fully enclosed, and gears run in oil to assure constant lubrication.

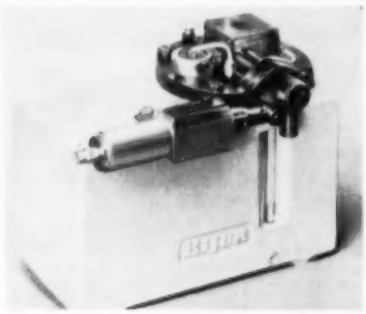
Over-all measurements of the reamer driver, including chuck, are 12¾ in. wide, 21¼ in. long and 9¾ in. high.

The Greaves Machine Tool Co., 100 Eastern Ave., Cincinnati 2, Ohio.

**T-9-51**

## Hydraulic Lubricator

Designed for applications where lubricant discharge per machine cycle is relatively small, the Cyclic Y lubricator will operate on any hydraulic line pressure from 500 to 3000 psi and



will deliver 2 cc of oil per lubricating cycle. By resetting hydraulic piston stroke adjustment, any one of seven different lubrication cycles can be obtained. Reservoir capacity is 6 pints.

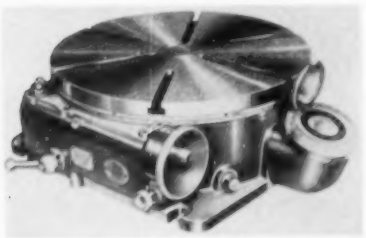
Service, Bijur Lubricating Corp., 151 W. Passaic St., Rochelle Park, N. J.

**T-9-52**

## Optical Circular Table

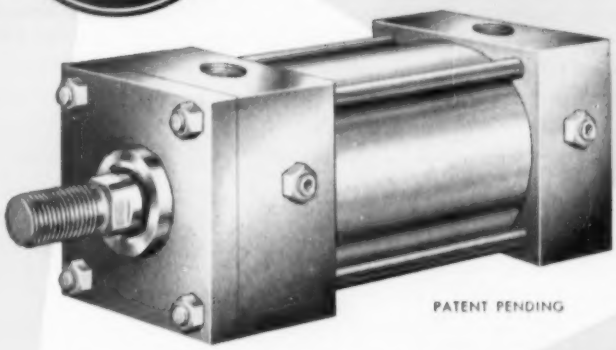
The Matrix 18-inch optical circular table is equipped with a 2-in. diameter illuminated screen, protected by armour plate glass, on which direct readings to 3 seconds of arc are clearly visible. The projection is accomplished by system of lenses from a large diameter glass circle graduated in 10 minute intervals. This glass circle built within the table is supported in a mounting that prevents movement arising from temperature change or shock.

Entire optical system is sealed against dust or oil and insulated from heat




FOR AUTOMATION

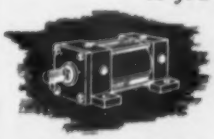
SP CYLINDERS



PATENT PENDING

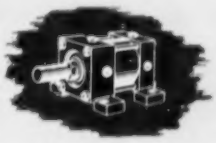
top performance–longest life

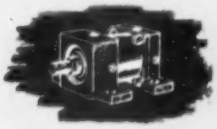
All S-P cylinders are engineered throughout for high speed, efficient operation. Piston rods are heat treated and hard chrome plated to resist scoring. Bronze cartridges with extra long bearing surfaces are easily removable for quick servicing of rod seals and wipers. End plates are rolled steel. All S-P cylinders are built to JIC standards.



**S-P STANDARD AIR CYLINDERS** have brass tubes to eliminate corrosion. Cushions float on O-rings for maximum cushioning. Eleven bore sizes, 1½" – 14". 21 mounting types. Readily modified for oil or water. Send for Catalog No. 110.

**S-P HEAVY DUTY AIR CYLINDERS** for automation and other severe applications. Double porting for extreme high speeds. Heavy wall seamless steel tube. Nine bore sizes, 1½" – 8". Five mounting types. Approved and used by two major automobile manufacturers. Send for Catalog No. 109-A.





**S-P HIGH PRESSURE HYDRAULIC CYLINDERS** have seamless steel tube. Special locking mechanism eliminates tie rods. Designed for 2,000 psi. Eleven models in 11 sizes. Send for Catalog No. 104.

Step up production with S-P cylinders. Representatives in principal cities. Prompt deliveries. Order catalog by number shown above. The S-P Manufacturing Corporation, 30201 Aurora Rd., Solon, Ohio. *In greater Cleveland.*

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SP THE S-P MANUFACTURING CORP.

SOLON, OHIO • *IN GREATER CLEVELAND*

ESTABLISHED 1916 A BASSETT COMPANY

NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS
POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES, ACCESSORIES

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radiated by the projection lamp. Worm wheel drive provides smooth, uniform table rotation and minimum back lash. The table is securely clamped by two diametrically opposed clamps operated by a single lever.

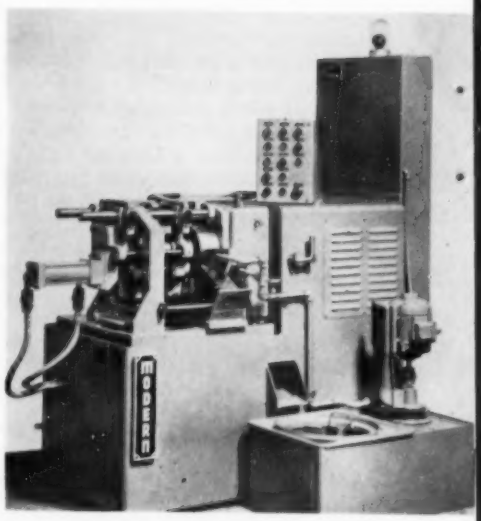
Distributed in the United States by Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill. **T-9-53**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Deburring and Chamfering Machine

Universal two-station deburring and chamfering machine, with integrated automation equipment for high production rates, functionally chamfers and deburrs gear teeth at both ends of a groove. Each part is automatically processed through two work positions in a cycle time of six seconds at a rate of 600 parts an hour.

Although the automation equipment is custom tailored, on the Model BMED-




14S, the basic universal machine will handle spur gears, helical and straight-sided as well as involute-form splines from 5/8 to 6½ in. PD. Production rates of up to 5 teeth per second per side can be assured.

The automation equipment works off a single air cylinder and four interlocked limit switches.

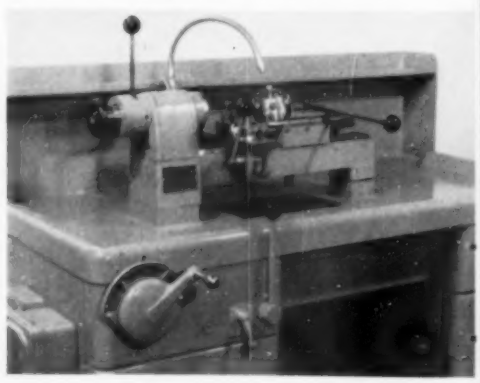
Parts are fed one at a time from a distribution system and chuted to a stop where they are checked by mechanical fingers for proper horizontal position. If misaligned, the machine automatically shuts itself off, and flashes a visual signal until manually cleared. Properly oriented parts continue through the chute.

Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, Mich. **T-9-54**

## Lathe

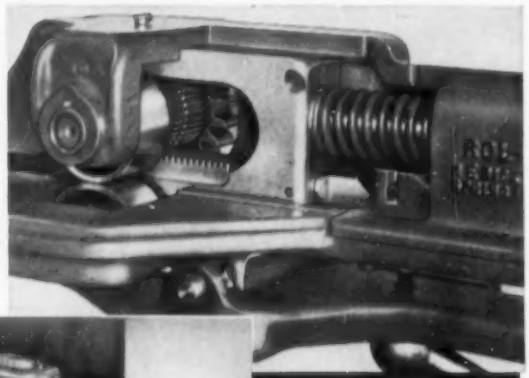
The lathe, designated Model A, has ½ in. capacity through the spindle. It is shown mounted on a steel cabinet which has a top surface of 48 in. long x 21 in. deep and has an oil cooling system.

This precision tool has a ball-bearing headstock with a runout of less than



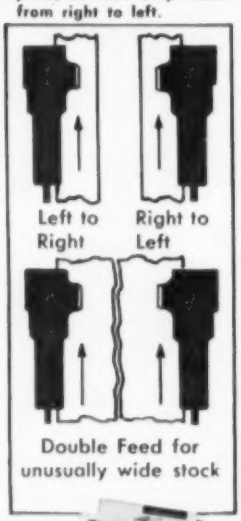

**Big Feeds...Big Production...Big Profits...**

**at SMALL COST!....**





Dickerman 12" Rol-Di-Feed, conventionally mounted on the bolster of a punch press, to feed strip stock from right to left.




Here's a new, versatile feed designed to outperform others costing up to 8 times more! The Dickerman 12" Rol-Di-Feed is easily installed on any punch press. This new feed handles with equal ease such different materials as paper, plastic, or cold rolled steel—in thicknesses ranging from .003" to 3/16" in any type of die—piercing, blanking, compound, progressive or draw. The 12" Rol-Di-Feed feeds on the press upstroke and on the downstroke, permitting accurate stock feeds up to 12" per cycle.

Open side design accommodates stock of almost any width. 12" Rol-Di-Feed can be mounted to feed in any direction . . . or installed in pairs to handle unusual sizes and types of stock. For greater production and profits, eliminate costly "special" feeds—install the new standard Dickerman 12" Rol-Di-Feed on all your press equipment!

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H. E. DICKERMAN MFG. CO.

321-317 Albany St. • Springfield, Mass.

Send today for literature on the complete Dickerman line.



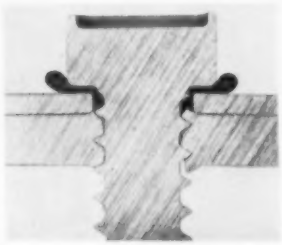
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-182

0.0001 in. at headstock. It has a quick-closing headstock and V belt drive. Six-position turret has 5/8 in. holes for tools, double compound rack and pinion slide rest with a front tool post that will swivel 360 deg. Over-all length of lathe is 24 in.; bed length is 22 in. Swing is 5.905. Distance between centers is 12 in. Motor has an adjustable speed from 213-4275 rpm with two speeds and full reversing. A mechanical clutch can be supplied.

F. W. Derbyshire, Inc., Waltham, Mass. **T-9-55**

## Fastener Seal

A controlled-flow waterproof, vibration-dampening fastener has a cushioning feature which protects porcelain and other highly finished surfaces. The fastener-seal, called Nyltite Staps, consists of a self-conforming nylon washer preassembled to a standard P-K self-tapping screw. The washer, made of Zytel, compresses against head and threads of the fastener as the screw is turned in and thus seals the opening. The washer is folded upon itself so that



the edges of the Nylon appear only on its inner circumference; the fold comprises the outer rim.

Nylon provides resiliency, has a good recovery factor and high tensile strength. In Nyltite washer, the folding of the nylon washer upon itself, dampens vibration, reduces noise and safeguards costly finished surface against chipping, cracking or crazing.

Electrolytic deterioration resulting from contact of dissimilar metals is retarded as the washer prevents contact of exposed areas of the fastener with that of the engagement material.

Parker-Kalon, Div. of General American Transportation Corp., Clifton, N. J. **T-9-56**

## Oil Base Additives

A group of oil additives are chemically formulated to be added to mineral oils in proportions varying from 1 to 20 percent to form metal cutting oils.

Cimcut AA Concentrate (general purpose) is a sulphur-chlorinated oil additive, which has chemically effective extreme pressure and polar lubricating properties. Cimcut NC (noncorrosive) is a sulphurized oil additive and is particularly suited for nonferrous metals. Cimcut SS (heavy duty) is a sulphurized oil additive for use on ferrous metals only. It is designed for jobs with exceptionally low cutting speeds and extremely small tool clearances on steels with machinability ratings of 45 percent or less.

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati 9, Ohio. **T-9-57**

## Air Hose Nozzle Holder

This magnetic air-hose nozzle holder clamps to machine tools at the point of use to clear away cutting. The device, marketed under the name Dilley Magnetic Nozzle Holder, consists of a pliable rubber nozzle fastened to lifetime magnets of 110 or 35-lb pulling power. Slight, one-finger pressure starts the flow of air through the nozzle, and air is shut off as pressure is released.

A single motion of the operator's




FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-183



*Toolmakers' microscope reads to 0.0001" and 1 minute of arc. Co-ordinate range 4" x 2". Compact built-in rotary stage.*

## Make precise measurements to 0.0001" and cut rejects with Gaertner microscopes

Here are reliable, easy-to-use microscopes for precise, indisputable measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. With these instruments you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear.

Through the engineering facilities at our Chicago plant, these versatile, well-constructed microscopes can be adapted to meet your exact needs. Find out now how you can gain new production savings with Gaertner measuring microscopes.

**Coordinate Measuring Microscope**

High precision, low cost instrument for 2 dimensional linear measurement. Range 2" x 2", reading to 0.0001".





**Micrometer Slide Comparator**

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

**Scale Micrometer or Shop Microscope**

High quality, low cost instrument with range up to 0.100". Reading to 0.001", easy interpolation to 0.0002".



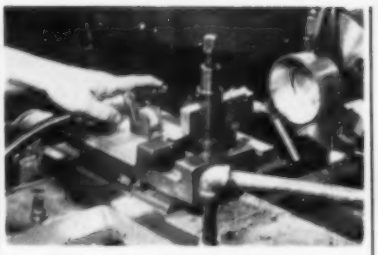
**Write for Bulletin 161-54**

**The Gaertner Scientific Corporation**

1241 Wrightwood Ave., Chicago 14, Ill.

Telephone: BUckingham 1-5335

INDICATE A-9-184-1

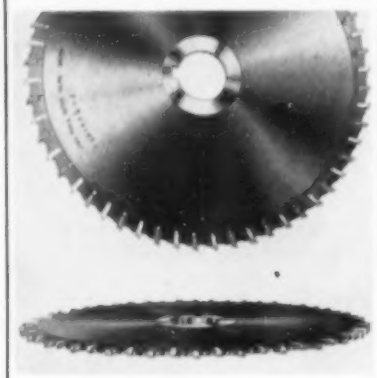


hand is all that is needed to clear away machine cuttings. The nozzle holder remains anchored in the most convenient position when in use but can be adapted to position coolant tubes and spray nozzles.

The Dilley Mfg. Co., 1655 Doan Ave., Cleveland, Ohio. **T-9-59**

## Milling Cutters

Thin, alternate-angle, free-cutting milling cutters for sawing and for cutting narrow, accurate slots are made with tapered, serrated, self-locking blades. The blades are forged of high-speed steels, scaled down for narrow



cuts. Reinforced bodies are forged of tough, nickel-alloy steel. Ground blade faces and ample chip room result in unusually free-cutting action.

Replaceable blades are available in any diameter from 3 to 24 in., and in widths from $\frac{3}{16}$ to $\frac{3}{4}$ in.

Apex Tool & Cutter Co., Shelton 16, Conn. **T-9-60**

## Air Control Valves

Design of the Nopak-matic pilot operated poppet-type air control valves incorporates an automatic Flow Director pilot head which provides valve versatility and simplifies piping.

The Flow Director, a system of ball checks, is an integral part of both single and double solenoid pilot control heads. It automatically picks up pilot pressure from whichever port is used as the inlet and directs it to the pilot valve.

Because of this design, all 2 and 3-

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**THESE 40-TON PRESSES**

**take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are very moderately priced.**

*Significant savings may result if you let our engineering staff assist you. There is no obligation.*

*Rousselle Presses are sold exclusively through leading machinery dealers.*

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**SERVICE MACHINE CO.**

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INDICATE A-9-184-2

way Nopak-matic valves can be piped Normally Open or Normally Closed to pressure simply by piping to the proper port. All 4-way valves can be piped with pressure to either of two inlet ports, thus changing the flow pattern through the valve. The valve, therefore, can be installed in the most accessible position. Flow Director pilot heads are interchangeable on all valves. ¼ through ¾ in. pipe sizes.

All models are subplate mounted and meet JIC Standards. Every 2 and 3-way model has two cylinder outlet ports; all 4-way models are available as standard with side or bottom ported subplates.

Galland-Henning Nopak Div., 2750A S. 31st St., Milwaukee 46, Wis.

**T-9-61**

## Rotary Cutting Unit

Capable of cutting 20 in. and larger pipe, with a cut surface finish suitable for gasket face use, the rotary cutting machine shown can handle a 40 ft length of 20 in. diam or larger pipe with wall thickness of ⅞ in. or heavier provided the first cut is 5 ft or more.

Controls to move the chucking drive up and down for centering, as well as



the locking system which holds the chuck in proper length position, are hydraulic.

Back and forth movement of the chucking device to control length of cut piece is electrical as are the rotation and cutting units.

Wallace Supplies Mfg. Co., 1304 Diversey Pky., Chicago 14, Ill. **T-9-62**

## Feed Rate Indicator

This feed rate indicator, which provides immediate, accurate readings, is designed primarily for use in the setting of hydraulic feeds on machine tools.

Indicator operates as a result of voltage passing across a linear potentiometer in such a manner that a motion of the movable contact creates a signal which varies with the rate of feed. This signal then is indicated by a meter, calibrated in inches per minute.

The indicator provides feed-rate


Zagar

**Gearless Drill Heads**

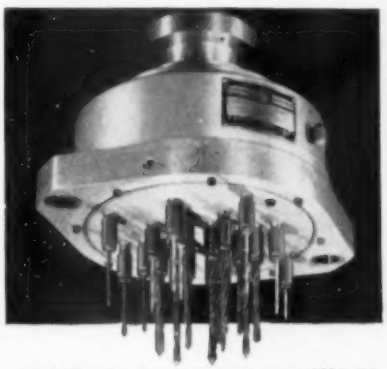
**put 4 big advantages to work for you**

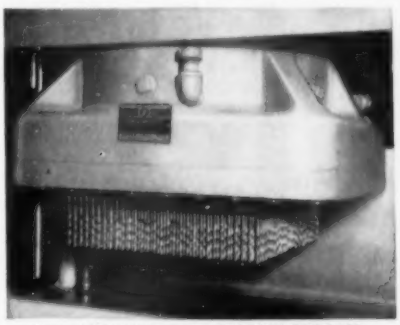

Any number of holes

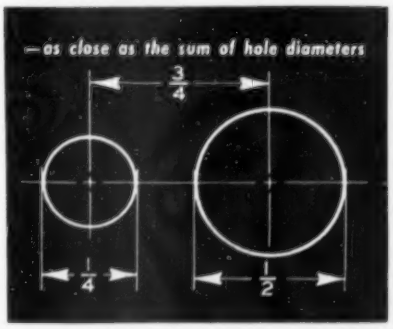

Any hole pattern


Any material


On all centers


Any hole pattern — on any center up to 1½" dia.


Up to 1200 holes can be drilled IN ONE PASS.




***A Zagar drill head is never obsolete. Zagar can re-locate spindles for other hole patterns.***

Can you visualize the savings made possibe by drilling up to 1200 holes at one pass? Zagar standard practice can handle any machinable material up to 1½" diameter. Holes of varying diameters can be drilled to form any pattern. Zagar Gearless Drill Heads, their efficiency proven by many years' success, can be installed on existing drill presses. Or, Zagar will lay out the necessary tooling for your entire job. May we see your sample parts and study your requirements? There is only one *right* answer — one *best* answer — for those requirements. May we supply it?

*Get more information via Zagar's Engineering Manual E-9.*

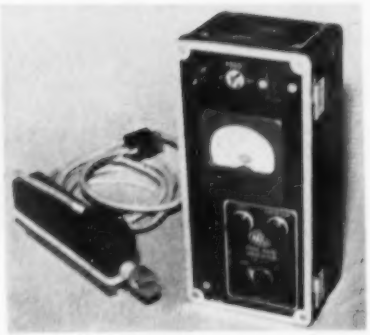



**ZAGAR INCORPORATED**

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Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

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ranges of 0 - 10 and 0 - 50 ipm, with accuracy within plus or minus five percent. Other scales are available.

It utilizes miniature vacuum tubes, and is powered by hearing aid batteries, with standard flashlight cells for tube filament power. Electrical components are mounted on a laminated plastic panel and protected by a cast aluminum case 6¾ x 9⅝ x 4¾ in. Upper half of the case provides storage space for the pickup unit and connecting cable.

The potentiometer operating rod is fitted with a permanent magnet making the pickup unit self-attaching to the movable member of the machine tool. This method of attachment also allows the rod magnet to pull free if the tool slide exceeds the potentiometer stroke length.

National Automatic Tool Co., Inc., Richmond, Ind. **T-9-62**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Adjustable Spacing Collars

This micrometer adjustable spacing collar for milling machine cutter arbors is available in sizes ranging from ⅝ to 3 in. for all standard cutter arbors.

Outer barrel of the collar is marked so that it can be adjusted plus or minus against the thousandth graduations of



the inner barrel by means of a furnished spanner wrench.

The graduations are so spaced that 0.001 adjustment can be readily obtained assuring positive adjustment when the collars and cutters are locked on a given arbor.

Dayton Rogers Mfg. Co., Minneapolis 7, Minn. **T-9-63**

## Drilling-Tapping Machine

The Natco H-6 multiple-spindle drilling and tapping machine is now available with preset selective cycle control and a straight-line indexing slide. This combination is designed to make automated drilling and tapping practical for small lot production.

At work, the operator unloads the finished part, loads a new one and depresses the starting switch. The machine then goes through all operations and returns to the loading position.

Over 100 combinations of operations are possible simply by setting selector dials. Machining functions available include drill, tap, step drill, chamfer, countersink, counterbore, spotface and skip.

Table feeds are controlled by means of two dials, one for drilling and another for tapping. Because of vertical float arrangement built into the spindles, taps of different leads can be used.


WHITNON
Precision SPINDLES



Rated Double A for Absolute Accuracy!

Absolute dependability and balance is assured by dynamic electronic balancer that checks spindles after assembly — to provide the ultimate in on-the-job perfection.

America's finest complete line of Precision High Production Spindles for Boring, Grinding, Milling and Drilling




Whitnon precision Spindles have been developed for new and replacement applications. The extra rigidity from large spring pre-loaded bearings assures constant chatter-free life.

Correct pre-loading mechanisms keep Whitnon Spindles and bearings tight at all times to compensate for changes created by temperature variations and wear.

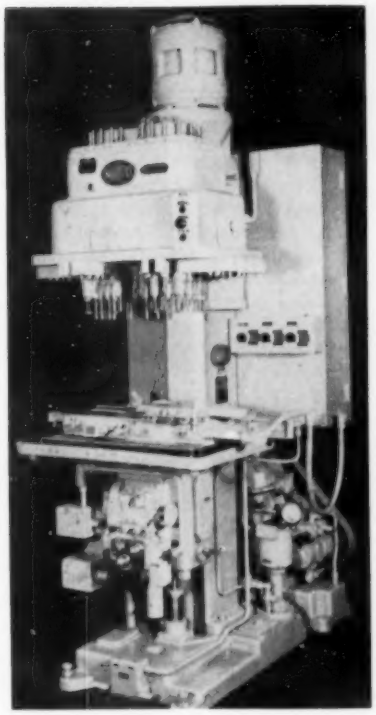
Whitnon Spindles for Milling and Engraving will increase the output of your machines. Whitnon-held tools cut on all lips, hence tools cut better, faster and last longer . . . producing a finer finish.

Whitnon Spindles are built for high speed and long life. Drills stay sharp and produce a straight and round hole.

Write for Literature Today.

THE Whitnon MANUFACTURING COMPANY
ROUTE 6 AND NEW BRITAIN AVE., FARMINGTON, CONNECTICUT

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-186



The hydraulically-actuated indexing slide is electrically controlled by means of the selector switches and is available with 2, 3, 4 or 5 positions. Various workholding fixtures can be mounted on the slide.

The basic machine consists of a multiple spindle geared head and a hydraulic feed table. Spindles are driven through universal joints; they can be arranged with adjustable arms for positioning or can be fixed in the required layout by a slip spindle plate fastened to the head of the machine. Up to 24 spindles can be used on the H-6 depending primarily upon horsepower consumed.

Spindle drive motor is 3 hp on the standard H-6 and 5 hp on the heavy duty machine.

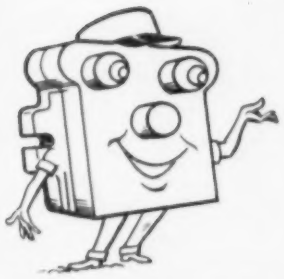
National Automatic Tool Co., Inc., Richmond, Ind. **T-9-64**

## Spacer Table

Automatic positioning spacer table may be used in any shop equipped with a drilling or boring spindle. It embodies simple, manual operation and can be used by any drill press operator after a few minutes of training.

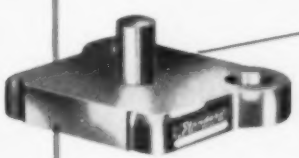
Accuracy of the spacer table depends solely on the accuracy of the spindle under which it is used. Drilling and tapping may be performed without jigs. Drilling, reaming and boring are done to close tolerances without boring fixtures.

Sturdy construction of the table permits heavy duty drilling. There is no

Stan the die set man says:

**These details make the difference...**



**Punch and die holders fully stress relieved** — when you lay out work on a "Standard" die set, the dimensions "stay-put" because "Standard" uses a metallurgically correct stress relieving process which produces great dimensional stability.



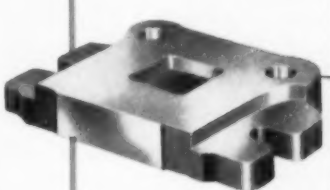
**Bushings — hardened, ground, and honed** — provide full-length bearing for longer wear. Pre-shrunk in deep freeze for stress-free assembly into punch holder.



**McVey Design Precision Posts** (pat. applied for) for fast, easy assembly and disassembly of die sets — without hammering or pounding.

**Posts chrome-coated** for low friction and long wear.

**Posts pre-shrunk in deep freeze** for precision assembly into die holder holes. Bond of post in plate helped by Pentrate finish of post end.



**Special Machine Work** further stress relieved for added assurance of dimensional stability and precision fit of posts and bushings.




Send for Die Set Comparison Chart and see for yourself why experienced tool and die makers specify and insist on "Standard" every time.

*YES, there's a difference in die sets and "Standard" makes the difference!*

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☐ I would also like a FREE sample of "Standard" die makers grease.

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IT'S POWRARM RIGHT DOWN THE LINE

*. . . At Power Products Co., Grafton, Wis.*

Wilton PowRarms, placed every two feet on a 100' long conveyor, help Power Products Corporation assemble six gasoline engine models on a single line. PowRarms, which can be moved to any angle in all three planes, and locked in position, enable operators to adjust work pieces to any convenient angle of approach. The result is an exceptionally high rate of production on all models. PowRarms come in a wide range of automatic and manual models.

Attach this ad to your letterhead for a free demonstration or literature!



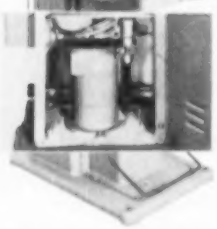
WILTON TOOL MFG. CO., INC.
SCHILLER PARK, ILLINOIS

*Wilton Vises Are Sold by Leading Distributors Everywhere* TE-9

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BETTER IN DESIGN IN OPERATION
RUTHMAN
GUSHER
Coolant Pumps



Illustrated is a Snow Manufacturing Co. Single Spindle Vertical Full Universal Tapping Machine equipped with a Gusher Pump.

Simple in design with fewer moving parts to wear, Gusher Coolant Pumps will give you year after year of very efficient service at very low maintenance cost. The pre-lubricated heavy-duty ball bearings require minimum attention. The electronically balanced rotating assembly eliminates vibration. Always specify Gusher Coolant Pumps for a trouble-free coolant system.



Type 1 P-3 Short

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Write today for catalog

Ruthman MACHINERY CO.

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

1810 Reading Road Cincinnati, Ohio

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overhang and wide bearing areas make the table equivalent to an almost solid mass.

Operating mechanisms are simplified, and there are no electronic or hydraulic components.

Locations may be established by any of a variety of methods. First piece or toolroom work, may be done by using gage blocks or end measures and micrometers. Practically any measuring units may be used. The spacer

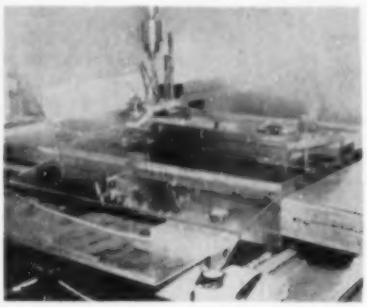


table will also accommodate De Vlieg's Duplitrol bars which may be purchased to individual specifications or to one-inch spacings.

The positioning units will duplicate to less than 0.001 in., any measurement standard used. Indicators and measuring troughs are conveniently located.

Table top area is 16 by 24 in. There are five 9/16 in. T slots. Longitudinal travel is 18 in., and cross travel is 14 in. Overall height is 9 in.

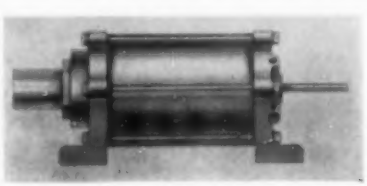
Industrial East Co., Clifton, N. J.

T-9-65

## Rotary Actuator

This integral servo valve rotary actuator, which operates on a closed loop, is a high power, high-torque amplifier that permits a small input torque in the order of inch ounces to control an output torque of thousands of foot pounds, depending on the size of the particular model. It is designed so that output and input circuits are hydraulically interrelated, thus the output shaft will always take the position commanded by the input shaft.

The input control shaft lends itself readily to any method of remote control. It may be driven mechanically by means of cable, rods or any other device. Electrically, a servo motor, synchro, rotary solenoid can do the job



with a minimum of effort with a high accuracy which in some models is as close as ¼ deg of arc.

Since input torque requirements are very low, small sizes of electrical components may be used.

The device is composed of two basic elements: a rotating input shaft which is coupled to a slide type valve, and a rotating output shaft which is attached to a set of movable vanes. Models are available with one set of vanes which move through an arc of 270 deg. If twice as much torque is required with the same package, a second set of vanes is incorporated, but the arc reduced to 95 deg. All high-pressure seals, etc., are made of teflon.

Industrial Control Products, Inc., Caldwell, N. J. **T-9-66**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Limit Switch

Line of heavy duty machine tool limit switches, Loxswitch Model L100WSO, provides two isolated circuits with overlapping contact arrangement. The spring return mechanism holds one circuit closed.

Actuating the operating lever approximately 5 deg closes both circuits and travel of an additional 4 deg opens the first circuit while keeping the second circuit closed. The spring return reverses this procedure.

Normally furnished for clockwise operation, with counterclockwise spring return, the switch is readily adjustable in the field for operation in the opposite

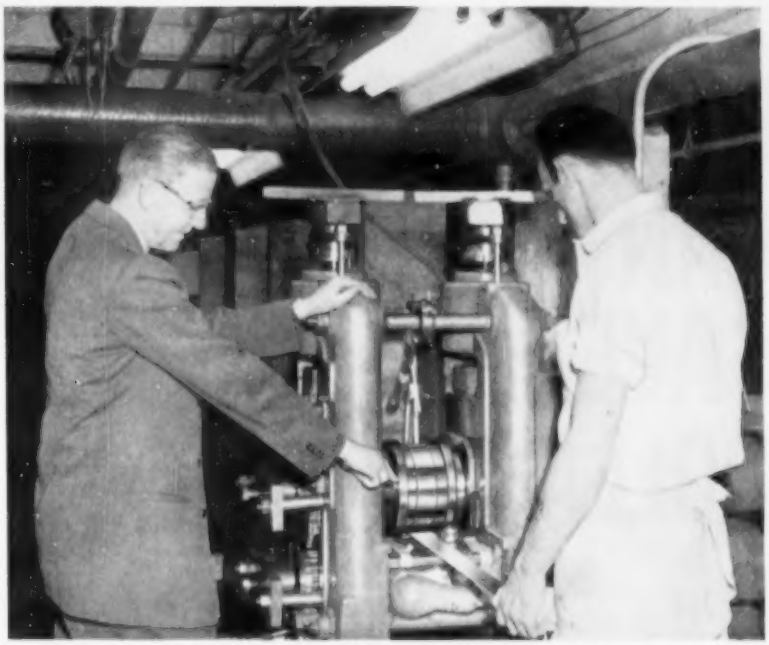


direction. Safety overtravel of 70 deg in each direction is provided. The switch is enclosed in a water, dust, and oil-tight enclosure.

The line includes single pole, double pole and three pole contact arrangements as well as various arrangements for neutral position switches. Ten models are available with a total of 23 basic contact arrangements.

The R. B. Denison Mfg. Co., 102 St. Clair Ave., N.W., Cleveland 13, Ohio. **T-9-67**


## *Proof of Vulcan Tool Steel Superiority*



**Cold rolling** of critical heat resisting alloy stator vanes at D.E. Makepeace Company, Attleboro, Mass.

# Vulcan Service PLUS TCM Steel solves tough rolling problem on jet stator vanes

Vulcan sales engineers, working closely with the tool experts of D. E. Makepeace, faced a tough and exacting problem: How to increase the service life of rolls used in cold rolling critical jet engine heat resisting alloy stator vanes.

As a result of joint investigations, design changes were recommended and adopted. The result? Roll life was multiplied.

Vulcan engineers went further. Despite the fact that other grades of tool steel had been tried and found unsatisfactory, Vulcan engineers predicted that *additional* improvements could be made by using Vulcan TCM steel. This recommendation, too, was adopted. The result? The already increased roll life was *trebled*. Net result: substantial savings with increased roll life, less down time and greater productivity.

This same engineering help is available to you without charge. For the name of your nearest Vulcan representative, write, wire or call collect. Vulcan Crucible Steel Division, H. K. Porter Company, Inc., Aliquippa, Pa.

H. K. PORTER COMPANY, INC.
VULCAN CRUCIBLE STEEL DIVISION
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# HOW MANUFACTURERS CAN SAVE DOLLARS

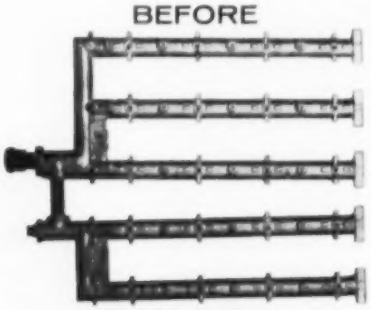


## . . . *EASY-FLO brazing cuts costs from design to delivery*

The amount of good you can do your product and yourself by ordering Handy & Harman silver brazing alloys is often best illustrated by dollars and cents figures. Silver brazing with Handy & Harman EASY-FLO and HANDY FLUX proves itself in many ways; its advantages are immediate and significant. The following "brazing benefits" apply to the example illustrated here . . . and easily could apply to your product.

**EASY-FLO Brazing**: Permits the use of standard materials • Reduces production time (increases production rate) Simplifies manufacturing (cuts down on rejects) • Makes a lighter weight product (easier to handle, cheaper to ship) • Often makes a product stronger and more compact

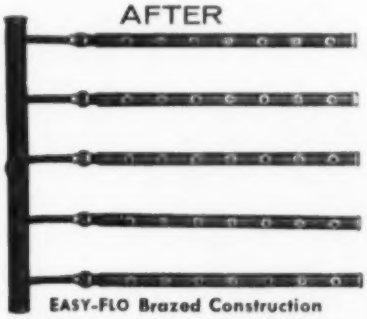
BEFORE



**Cast Construction**
(Approximate Costs)

| | |
|---|---|
| Castings Complete | $4.92 |
| Machining | 2.76 |
| Total Cost | $7.68 |
| Production Time | 1½ hours |

AFTER



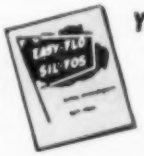
**EASY-FLO Brazed Construction**
(Approximate Costs—based on 20,000 run.)

| | |
|---|---|
| Materials | $1.75 |
| Screw Products & Stamping | .45 |
| EASY-FLO Brazing Alloy | .10 |
| Assembling and Brazing | .90 |
| Total Cost | $3.20 |
| Production Time | 40 minutes |

The gas burner shown here is just one example of how silver brazing can simplify product design and materially reduce production costs. Put *your* product in this picture, the results could be just as beneficial.

**TAKE A LOOK**

. . . at Bulletin 20. This concise introduction to silver alloy brazing talks about joining methods, as well as joint design and economies that can be enjoyed with EASY-FLO brazing. We'll send you a copy whenever you request it.




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# Men at Work

**Robert A. Schafer** is now vice-president in charge of engineering for Baker Brothers, Inc. Mr. Schafer, who previously was an engineering executive with National Automatic Tool Co., brings to his new post more than 30 years experience in the field of machine tool design.

**Bennett D. Jones,** formerly manager of product development for Standard Pressed Steel Co., was advanced to the post of technical director in the company's Aircraft Div. He will coordinate company research and product development activities with needs of aircraft and missiles industries.

**James J. Jones** was appointed sales manager of the contract sales division of Hartford Special Machinery Co. to succeed Harvey L. Spaunburg Jr. Mr. Jones, who has been with Hartford in manufacturing methods and sales estimation for the past eight years, is a member of ASTE's Ft. Wayne chapter.

**Durwood A. Blaisdell** is new executive vice-president of The Baird Machine Co. assuming general management responsibility for all Baird operations. He formerly was a general partner with Baker-Goodyear & Co.

**Donald Roon,** formerly executive vice-president of Houghton Laboratories, Inc., has been elected president of the company to succeed **Russell M. Houghton** who resigned.

Metal & Thermit Corp. has announced several transfers. **D. W. Oakley,** previously technical advisor to the president was made production manager. **H. A. Rack,** formerly production manager, became manager of engineering. **C. H. Carpenter, Jr.,** who was assistant manager of market development, was named technical advisor to the president. **K. E. Doud** became assistant manager of engineering, and R. E. Davis was transferred from central engineering department to the market development division.

**Arthur C. Ruge** has been named director of research development of the Electronics and Instrumentation Div. of Baldwin-Lima-Hamilton Corp. **Robert P. Lathrop** was made manager of research and development. Dr. Ruge, who was president of Ruge-de Forest, Inc. prior to its purchase by B-L-H in 1955, has been staff consultant on research and development for the division since 1956. Mr. Lathrop has been acting manager of the development section of the division.

Three promotions at The Carpenter Steel Co. involved **Douglas R. Beggs,** former assistant to the vice-president—production; **Foster W. Evans,** former superintendent of production control; and **Harold W. Miller.** Mr. Beggs now is general superintendent of the Reading plant. Mr. Evans was made production manager. Mr. Miller will continue as head of the company's engineering department while adding the responsibility of coordinating all engineering functions including electrical and mechanical maintenance. Mr. Miller is a member of ASTE's Calumet Area chapter.

Three key appointments in Chrysler Corp.'s Stamping Div. involved **George S. Aradan, John H. Davis** and **Ernest W. Marchand.** Mr. Aradan was promoted from assistant master mechanic to divisional master mechanic. Mr. Davis, who was assistant resident engineer at the company's Outer Drive plant, is now divisional chief engineer. Mr. Marchand, who recently joined Chrysler, is manufacturing manager for the Mack Ave. plant.

The post of O.B.I. engineering supervisor at the Hamilton plant of Clearing Machine Corp. has been assigned to **John Prendergast.**

**Daniel W. Cameron was appointed vice-president-manufacturing of Montreal Locomotive Works, Ltd., an affiliate of Alco Products, Inc. He was formerly vice-president-manufacturing.**



**F. M. Fahrenwald, chairman of the board and president of the Fahralloy Co., was elected to serve as president of Alloy Casting Institute at its annual meeting. He succeeds Bradley B. Evans.**



**Lester D. Martin is new vice-president in charge of sales of The Oster Mfg. Co. succeeding Arthur S. Gould who retired. Mr. Martin also was elected a director and will continue as treasurer.**



**Harvey L. Spaunburg Jr. has been named manufacturing manager of Hartford Special Machinery Co. Associated with the firm since 1950, he has been sales manager of the contract sales division.**



**Walter E. Callison** has been named manager of Brehm Die Div. of Vulcan Tool Co. Prior to joining Vulcan he was an assistant manager with Steel Products Engineering Co.

Lewis Welding & Engineering Corp. has announced appointment of **Charles E. Huddleston** as director of engineering. He previously was associated with Olin Mathieson Chemical Corp. as engineering manager of the arms and ammunition division.

Scovill Mfg. Co. recently announced appointment of **Norman J. Schaffer** as works manager of its Forging and Screw Machine Div. Associated with Scovill since 1939, he has been factory superintendent for the division.





**E. P. Bullard III (left) is new president and general manager of The Bullard Co., and E. C. Bullard (right) was elected chairman of the board and chief executive officer of the company. The new president has been vice-president and assistant general manager. The new chairman was president and general manager since 1946.**

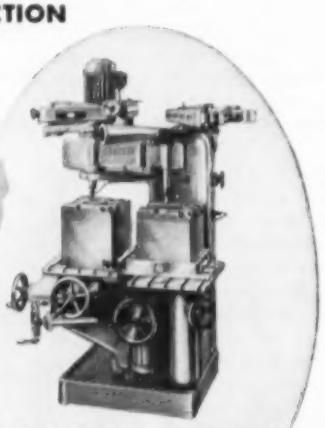
Appointment of **Felix Zawaski** as plant manager has been revealed by Gear-O-Mation Div. of Michigan Tool Co. He has been a process engineer since joining the firm in 1954.




ECONOMICAL, ACCURATE PRODUCTION OF DIES AND MOLDS WITH THE LATEST

DECKEL

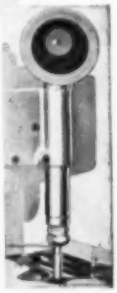
universal pantograph
DIE SINKING MACHINE
model KF12



Deckel die sinking machines are justly famous for their accuracy, production rate, and ease of operation. The KF12, latest and largest Deckel model, does heavy die-sinking jobs which formerly required much greater investment in equipment. Spindle speeds from 60 to 10,000 r.p.m. enable you to do rough and finish milling, as well as light engraving, on the same machine. The newly developed, "mirror image" milling attachment produces right and left hand dies and molds from the same pattern. Other important features are illustrated below.

Deckel KF12 makes rapid, accurate enlargements or reductions from 1:1.5 to 1:4 as well as 1:1 duplication. The cutting tool covers an area up to 15¾" x 15¾" or up to 10" x 19¾".

Optical contacting device makes rough milling faster, more accurate. And, accurate rough milling reduces time for finishing.





Saddle elevating motor rapidly raises or lowers master and workpiece at the same time.



Circular forming attachment permits generating spherical shapes.

Get in touch with us soon for information on this or other Deckel machines: 2-DIMENSIONAL ENGRAVERS • 3-DIMENSIONAL ENGRAVERS UNIVERSAL MILLERS • UNIVERSAL TOOL & CUTTER GRINDERS

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**Louis R. Wanner** was appointed to fill the newly created post of manufacturing manager in charge of plastics, metal base, assembly and formatic operations for Sylvania Electric Products Inc. He will be responsible for manufacturing operations at the metal base and plastics plants in Warren, Pa., an assembly plant in Titusville, Pa. and a formatic plant in Naugatuck, Conn.

Vinco Corp. has announced election of **Joseph S. Sherer, Jr.** as president and board member to succeed **E. J. Eggart** who resigned. Mr. Sherer previously was president of Reo Motors, Inc.

**R. K. Hoffman,** manager of the Engineered Products Div. of Acme Precision Products, Inc., is now a vice president of the company. He has been associated with Acme since 1946.

**John R. Lenox,** formerly an administrative official of Minneapolis-Honeywell Regulator Co., has been elected vice-president in charge of operations of Datamatic Corp., wholly-owned Honeywell subsidiary.

Benchmaster Mfg. Co. has announced appointment of **Arch C. Shafer** as general sales manager. Prior to joining Benchmaster, Mr. Shafer was sales manager for Cold Metal Products Co. Metallon Div.

New manager of the product engineering department of Brush Electronics Co. is **Ralph V. Little, Jr.** He formerly was assistant manager of the department.

Appointment of **Carl O. Larson** as superintendent of its Machine Div. has been announced by Moore Special Tool Co., Inc. A veteran of 27 years with Moore, he now succeeds Hadar Wahlquist who retired.

**Nils Lindstrom** is now superintendent of the tool division of Moore Special Tool Co., Inc., succeeding **William D. Angell** who retired. A veteran of 20 years with the division, he served most recently as division foreman.

Announcement of the appointment of **John D. Knox** as head of project engineering has been made by Adamas Carbide Corp. Prior to joining Adamas, Mr. Knox served as production manager of Sintercast Corp.

**James D. Campbell** was appointed executive vice-president of Patterson-Emerson-Comstock Overseas, Inc., European subsidiary of Patterson-Emerson-Comstock, Inc.

Four new offices were created by the board of directors of Reliance Electric and Engineering Co. To fill the posts, **William R. Hough, Walter H. Haber** and **Hugh D. Luke** were made vice-presidents — operations groups, and **Richard A. Geuder** was made vice-president—marketing. Mr. Hough also is vice-president—engineering.

**Donald F. Levleit,** who has been factory manager of the Detroit plant of Continental Motors Corp., has been appointed general manager of Veet Industries.

Appointment of **Tom Conway** as director of manufacturing services has been made public by Borg-Warner Corp. He has been general works manager of the Lycoming Div. of Avco Corp. since 1954.

Bathey Mfg. Co. has appointed **Donald McLeod** as director of engineering and purchasing, a newly created position. He will be responsible for all engineering and purchasing relating to government contracts.

Earlier, the company announced appointment of **Glen R. Steele** as sales manager. Mr. Steele, who has been with Bathey for nine years, assisted with design and development of present products.

**John J. DiCicco** was made director of preproduction planning and analysis on Chrysler Corp.'s manufacturing staff. Mr. DiCicco joined Chrysler last May after 20 years of service in the automotive industry.

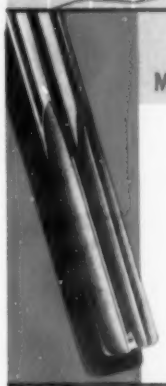
Appointment of **George Konkol** to the newly created post of manufacturing manager in charge of wire, weld and metal stamping operations has been revealed by Sylvania Electric Products Inc.

**Willard T. Holmes** is now director of engineering, and **Roy K. Stephens** director of manufacturing of the Alectra Div. of Consolidated Electrodynamics Corp. Mr. Holmes previously was director of manufacturing and Mr. Stephens was manager of the division's printed wiring department.


Atrax PROGRESS REPORT

SOLID CARBIDE TOOLS

CASE HISTORY #16
MID-WEST HEAVY MACHINERY MANUFACTURER



Atrax 7/16" & 1/4" REAMERS Series 1564

| | |
|---|---|
| OPERATION | Reaming 7/16" x 1/2" deep hole<br>Reaming 1/4" x 5/8" deep hole |
| MATERIAL | Cast Stellite, Rockwell C48 |
| SPEED - FEED | 7/16" dia.—350 r.p.m.<br>1/4" dia.—900 r.p.m. |
| PRODUCTION | 100 to 180 holes per tool. Carbide **Tipped** reamer produced 10 holes. H.S.S. none. |

CASE HISTORY #25
MAJOR AUTOMOBILE MANUFACTURER



Atrax SPECIAL END MILL 3/8" diameter Series 1507

| | |
|---|---|
| OPERATION | Milling transmission bodies. Plunge 3/4" and slot 7/8" |
| MATERIAL | Cast Iron |
| SPEED - FEED | 3840 r.p.m.—.0024 feed per revolution |
| PRODUCTION | 60,000 to 70,000 slots per tool. Previously used 1000 H.S.S. End Mills per month, now uses 24 Atrax mills. |

CASE HISTORY #42
MAJOR AIRCRAFT CORPORATION



Atrax H-183 and K-183 BURS

| | |
|---|---|
| OPERATION | Burring |
| MATERIAL | Kirksite Dies |
| SPEED - FEED | 15,000 to 20,000 r.p.m. |
| PRODUCTION | Solid Carbide Burs ran 1200 hours average before resharpening. Previously, resharpening H.S.S. burs cost company $100 a day. |

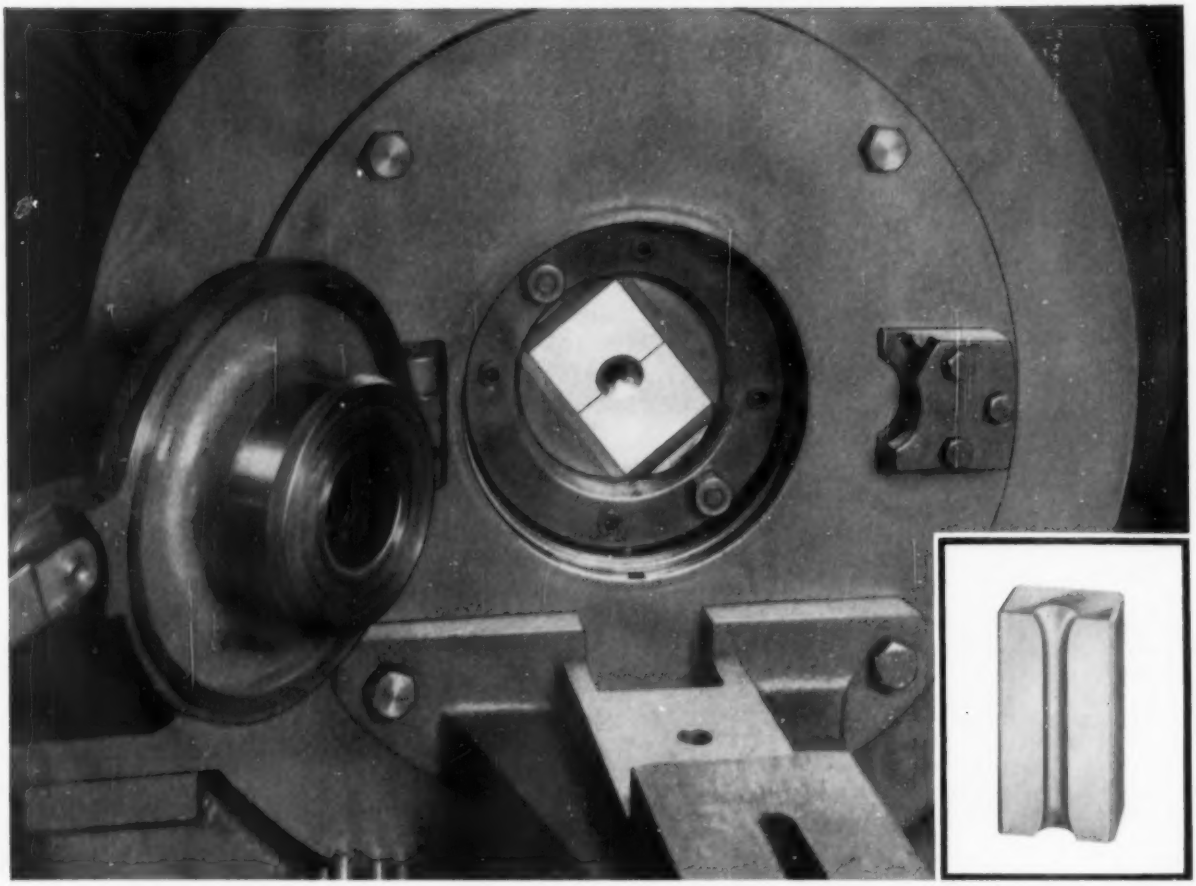
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# KENNAMETAL* Dies swage up to 50 times more pieces than steel

## with more accurate dimensions and better quality

By switching to dies made of Kennametal Grade K90, a manufacturer of hand tools has obtained these important benefits on a hot swaging operation:

- increased production of swaged steel alloy rods from 100 to 1000 pieces between dressings . . . machine down time greatly reduced.
- swaged pieces are now more uniform and of better quality.
- the Kennametal dies are outlasting the steel dies 30 to 50 times.

Although the Kennametal die blocks cost about five times more than the steel dies previously used, they quickly pay for themselves and show substantial profits on the investment.

As Kennametal dies and die sections are showing similar results on many types of operations, why not select Kennametal for your next die parts . . . for blanking, compacting, cold heading, cupping, drawing, forming, perforating, piercing, slitting, stamping or swaging.

You can choose from Kennametal's "90 Series" with six grades or the exclusive non-galling "80 Series" with three grades. These grades provide a range of carbides that meet the specific requirements of any die application.

A Kennametal die engineer will gladly work with you or your die maker in applying the right grade of Kennametal for your dies. Call him at your nearest Kennametal office or write to KENNAMETAL INC., Latrobe, Pennsylvania.

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# FIELD notes

## Student Clubs May Help Beat Engineer Shortage

Positive steps toward a remedy for the engineering shortage in the future have been taken by Michigan State University where a program originated for organizing clubs to stimulate the interest of high school students in an engineering career. JETS (which stands for Junior Engineering Technical Society) provide a means for youngsters to visit colleges of engineering or industrial plants and installations, talk to successful engineers, attend meetings of professional societies, and gain practical help in qualifying for an engineering college.

A chief activity of the clubs is construction of projects to discover what work engineers do. One such club built a digital computer; another developed a solar heated house model. Ordinarily a math, science or shop teacher acts as advisor.

Headquarters at Michigan State serves to help start the clubs and provide guidance. It has the largest collection of material prepared by industry, education and professional organizations designed to interest young people curious about engineering careers. Every week a packet of special, timely material is mailed to the clubs. A newsletter tells of club projects and describes new scholarships. The headquarters itself awards engineering scholarships to club members in Michigan and adjacent areas. However, it also passes on news of engineering scholarships at all leading institutions.

---

**Kett Corp.**, which was organized to provide consulting services in aeronautical, civil, mechanical, nuclear and electrical engineering and allied fields, has now been named Kett Technical Center, Inc. and will be located at Pompano Beach, Fla. The new subsidiary of U.S. Industries, Inc. will be housed in that company's new research and development center.

V V V

**New 100,000 sq ft** engineering center for Temco Aircraft Corp. has been opened at Garland, Texas. The ultra modern structure will provide space to house engineers which until now have been scattered in engineering groups some distance apart. It also will provide a computing room large enough to permit expansion of the "electronic brain" section.

V V V

**Ground** has been broken for a new $250,000 Western Research Center at Anaheim, Calif., for Robertshaw-Fulton Controls Co.

### new endeavors

**Continental Bearing** Research Corp. located at 489 Fifth Ave., New York, has been formed to provide engineering development and manufacturing in the bearing and lubrication fields. Objective of the company is to analyze, design and supply bearings, in production or semiproduction quanities for specific applications. It also will undertake design studies on a project or consulting basis. Stanley Abramovitz, formally associated with Franklin Institute, directs the engineering activities of the corporation.

V V V

**Russell M. Houghton,** who recently resigned as president of Houghton Laboratories, Inc. has formed a new company to be known as Conap Co. The firm will be a research and development organization devoted to formation and application of synthetic materials. The new company is located at 619 S. Union St., Olean, N.Y.

### name changes

**Associated Spring Corp's** West Coast operation in Gardena, Calif. is now known as Seaboard Pacific Div. instead of Seaboard Coil Spring Div. as was previously reported in this column. The company feels that the new name reflects more accurately the broader range of types of precision mechanical springs now supplied by the division.

**Coincidentally** with announcement of the transfer of its operations to a new $3¾-million plant in King of Prussia, Pa., The Automatic Temperature Control Co. revealed the change in its name to Automatic Timing & Controls, Inc. The new designation is considered more descriptive of the several product lines manufactured by ATC.

V V V

**Corporate name** of Greer Industries, Inc. has been changed to Disogrin Industries, Inc. In conjunction with this transition, its affiliation with Greer Hydraulics, Inc. has been terminated. Although the company headquarters remain at New York International Airport, Jamaica, N.Y. for the present, the company is scheduled to move to a new plant which will provide larger accommodations.

### acquisitions

**Miniature Precision Bearings, Inc.** has acquired, through merger, the Split Ballbearing Corp. According to Horace D. Gilbert, president of MPB, the joining of the two firms enables his company to broaden its base of operations and enhances its growth potential, giving it diversification without affecting the specialization needed to maintain the technical standards of both companies. Specialized identities of the two divisions are to be maintained according to present plan.

V V V

**Boice Gages, Inc.** has purchased the assets of Nilsson Gage Co., Inc. and will operate it as the Nilsson Gage Products, Inc., Div. of Boice Gages. It is expected that most of the personnel of the acquired firm will be retained.

V V V

**Minneapolis-Honeywell** Regulator Co. has purchased from Ratheon Mfg. Co. the latter's 40 percent stock interest in Datamatic Corp. for $4,500,000. Minneapolis Honeywell now owns all outstanding stock in Datamatic.

V V V

**Earl R. Putnam,** formerly a partner in Fastcut Tool Co., has purchased all outstanding stock in the company, thus assuming control. His immediate plans include addition of several new items to the company's line of cutting tools.

V V V

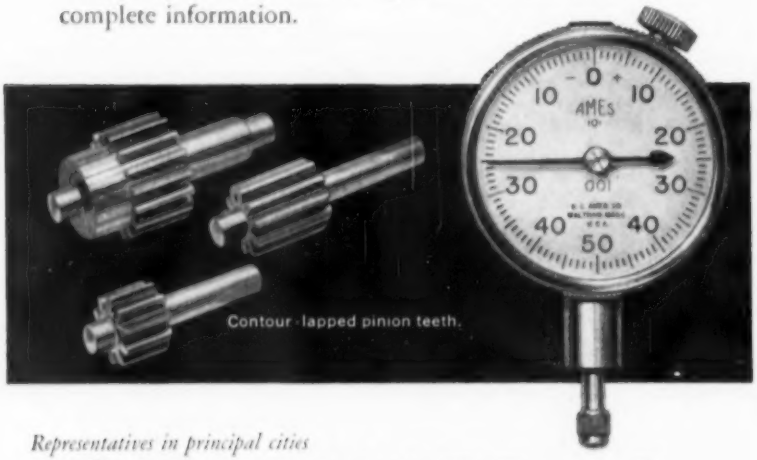
**The Hydraulic Press** Mfg. Co., a division of Koehring Co. has acquired the Henry & Wright Div. of Emhart Mfg. Co. Estimate price of the transfer is in excess of $1¼-million. Sale includes right to manufacture and sell the Henry & Wright machine and physical

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inventory including jigs and fixtures, patterns, tools and certain operating equipment. Henry & Wright will operate as a department of H-P-M.

V V V

**Acquisition** of the investment casting business of the N. A. Woodworth Co. has been announced by Consolidated Foundries & Mfg. Co. N. A. Woodworth, however, will continue its manufacturing and machining operations.

V V V

**Assets and business** of Cold Metal Products Co. have been transferred to Jones & Laughlin Steel Corp. The Cold Metal operation and business will become the Strip Steel Div. of J & L. Charles M. Beeghly, vice-president and general manager of Cold Metal now becomes president of the new division.

V V V

**Columbia Steel** Equipment Co., Inc. of Fort Washington, Pa. joined the group of industrial companies owned by Standard Pressed Steel Co. recently. Presidents of the two companies announced jointly that all of the stock of Columbia will be exchanged for 78,181 SPS shares. According to the announcement there are no contemplated changes in management, personnel or sales policies of either company.

### new organizations

**Engineers** representing leading solid carbide tool manufacturers met recently in Detroit to form The Solid Carbide Tool Institute. Long range objective of the organization is establishment of uniform physical standards for solid carbide cutting tools and also to standardize nomenclature and marking of this type of tool.

Officers of the new organization are John A. Wright of Rotary Tool Industries, president; Clinton Smith of Pratt & Whitney Div., vice-president; and Richard Englander of Essex Rotary File and Tool Corp., secretary-treasurer. Headquarters for the institute have been established at 295 Madison Ave., New York City.

V V V

**As an outgrowth** of the successful International Congress on Cybernetics held in Namur, Belgium, in 1956, authorities of that province provided the initiative for forming the International Association for Cybernetics. President of the organization is George R. Boulanger, professor of the polytechnic faculty of Mons and the University of Brussels. A permanent secretariat has been established with offices in Namur.

Stated aim of the association is to

insure a permanent link between scientists whose work in various countries is connected with cybernetics, and to further the development of that science and its applications and propagating the results obtained in that field.

More than a thousand applications for membership have been received, coming from 26 different countries.

## anniversaries

**A plant tour** and special festivities marked the 50th anniversary of Pendleton Tool Industries, Inc. The company, which was founded as a three-man blacksmith shop to make chisels and punches, now employs more than 1400 persons in its eight divisions and subsidiaries in the United States and Canada to manufacture a line of more than 2,000 hand service tools.

v v v

**The Park Drop Forge Co.** marks its 50th year of operation this year. The company, with factory buildings now covering more than 10 acres has greatly expanded its product variety from original production of automotive crankshafts to component parts for aircraft, marine engines, diesel locomotives, generator sets, air compressors, pumps, machine tools and tractors. Windsor T. White, one of the company's founders, was elected the company's first board chairman and still is serving actively in that capacity.

## new facilities

**An openhouse** program marked completion of a $3½-million manufacturing plant for Square D Co. in Glendale, Wis., a suburb of Milwaukee. Designed for high-volume production, the facility incorporates more than 2,000 ft of continuous conveyor systems.

v v v

**Two precision** mechanical spring manufacturing plants are being established by Associated Spring Corp. One is in Pointe Claire industrial district 13 miles southwest of Montreal, and the other is near San Juan, Puerto Rico. The Montreal branch will be operated by The Wallace Barnes Co., Ltd. a wholly-owned subsidiary of Associated Spring. The Puerto Rico plant will be operated by a wholly-owned subsidiary to be organized for this purpose.

v v v

**Jones & Laughlin** Steel Corp. have opened a cold finished bar mill in Willimantic, Conn. designed to produce quality cold finished steels primarily for New England markets. The one-story, 535-ft long L-shaped building contains approximately 90,000 sq ft of production and office space.

**A 10-acre site** at Santa Ana, Calif. has been selected for the new plant for Flexonics Corp. which will extend the firm's manufacturing facilities to the West Coast. It will house special production facilities for aircraft, rocket and missile industries besides assembly of industrial products and stocking Flexonics' product line.

v v v

**Completion** of a $125,000 investment casting and shell molding plant has been announced by Precision Castparts Corp. The new ultra modern plant, located on a three and a half acre tract at 4600 S. E. Harney Dr., Portland, Ore., will house the offices, engineering department, tool and die shop, and metallurgical laboratory as well as complete quality control and production facilities.

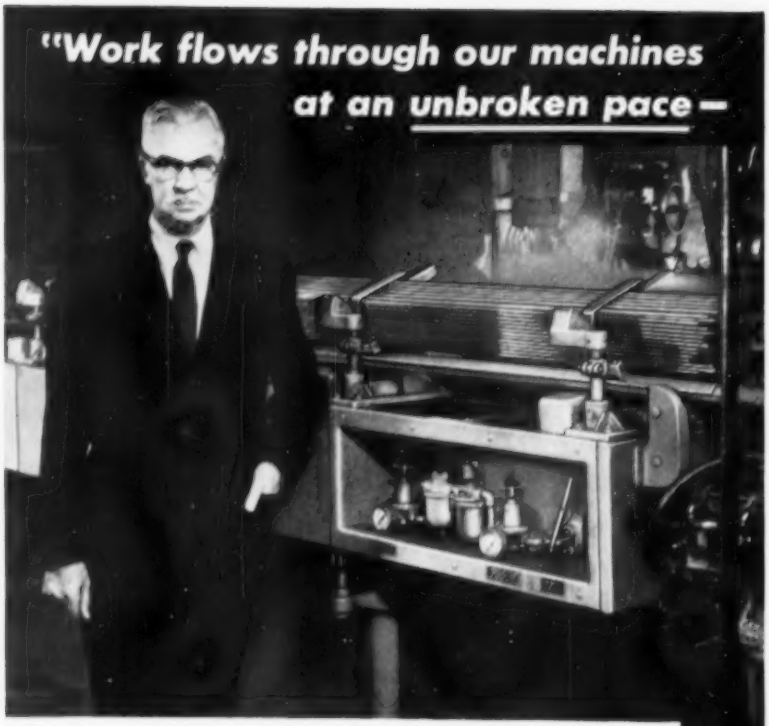
v v v

**Acme Steel Co.** has broken ground for its new $23-million steelmaking plant in Riverdale, Ill. near Chicago. The facilities, scheduled for completion





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**MAGAZINE LOADING BAR FEEDS"**

says Factory Superintendent Dan Thomas*

Our production figures ran all over the chart when we were using stock-feeding devices equipped with feed-fingers. In addition to tricky set-ups and frequent re-sets, we lost a lot of polished stock which had to be scrapped or refinished when scratched or marred by feed-fingers. Operators suffered fatigue and strain trying to stay on top of these mechanical "prima donnas." Production suffered from the slow-downs resulting from all these factors.

Our first test run of a Lipe A.M.L. Bar Feed proved that every one of these "bugs" could be eliminated—permanently. It fed stock continuously . . . without feed-fingers . . . with no repeat motion for feed-outs . . . no down-time for adjustments or remnant removal. There was no cutting air: From 7:30 to 4:00 every turn of the spindles produced *work* . . . at a day-in-day-out delivery of 58% higher production! Our entire department is now equipped with Lipe A.M.L. Bar Feeds.

**WRITE or WIRE** for a FREE Lipe Sales Engineering estimate of production increases, savings and amortization time of Lipe A.M.L. Bar Feeds in your production layout.

*Photographer's models and pseudonyms used to protect company identity and confidential information.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

BAR FEEDS • HEAVY-DUTY AUTOMOTIVE CLUTCHES • PORTABLE POWER HACK SAWS

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in late 1958, will introduce to this country a process in steel production that combines hot blast cupolas and oxygen blown converters. Initial capacity of the plant is planned for 450,000 ingot tons annually. The rolling equipment will have capacity substantially in excess of that amount.

## expansions

**The Carborundum Co.** has launched a $3,200,000 modernization and expansion program at its three silicon carbide furnace plants in the United States and Canada. According to report, major portion of the expansion will be at the company's Shawinigan Falls and Vancouver plants.

V V V

**Enlarged manufacturing** facilities have been completed for Kennametal Inc. at the company's Chestnut Ridge and Detroit plants. It also was announced that the mining tool division plant now under construction at Bedford, Pa., is expected to be ready for operation by late summer.

V V V

**The Illinois Gear** & Machine Co. has earmarked $2-million for an expansion of its South Works in Chicago. This will double the size of its heavy manufacturing division. More than half of the expenditure is represented by heavy machine tools.

V V V

**The new Pelletizing** Div. of Surface Combustion Corp. will be responsible for marketing and engineering of the process and equipment for complete pelletizing under license rights recently acquired from the Erie Mining Co.

V V V

**Plant of** Alloy Precision Castings Co. at 3855 W. 150th St., Cleveland, is being enlarged to make it possible to double existing facilities and to increase present number of employees by 50 percent before the end of 1957.

## new offices

**Offices** at 380 E. 200th St. in Cleveland have been opened by John Bath & Co., Inc. to provide faster service to the surrounding area. Robert H. Diday, sales engineer, is in charge of the facility which will maintain a stock of Bath taps and gages.

V V V

**Portage Double Quick,** Inc. recently opened a West Coast office and warehouse at 429 Rosecrans Ave. in Compton, Calif. to facilitate deliveries in the Western states. It will carry a complete inventory of all of the PDQ lines.

# Trade Literature

*for free booklets and catalogs—use convenient request card, page 169*

### Metal Finishing

Economical new method for machine production polishing metals described in folder entitled, "The Use of Spray Guns for Abrasive Buffing Compounds in Machine Metal Finishing," explaining equipment design, operation and technique. Comparative data on work life and maintenance costs shows advantages of the process. Lee A. Cuson, Suite 524, 2631 Woodward, Detroit 1, Mich. **L-9-1**

### Screws, Plugs, Pins

Revised, illustrated 32-page brochure reviews the complete Unbrako line of standard socket screw products, pressure plugs and dowel pins; covers heat-treated alloy steel and stainless steel socket head cap and set screws as well as stripper bolts, flat and button heads, etc.; includes detailed size data. Adv. Dept., Box 786, Standard Pressed Steel Co., Jenkintown, Pa. **L-9-2**

### Welding

Photos and articles on welding developments all over the world presented in 28-page Vol. XIV, No. 2, *Hobart Arc Welding News;* stresses time and money saving applications. Hobart Brothers Co., Troy, Ohio. **L-9-3**

### Grinding Wheels

Extensively illustrated, 36-page booklet, "Cincinnati Grinding Wheels," Publication No. PG-320, describes PD grinding wheels and the positive duplication manufacturing process; also discusses wheel markings and their meanings, grinding wheel types and uses, characteristics of incorrect wheel grading and grinding faults. Cincinnati Milling Products Div., 4701 Marburg Ave., Cincinnati 9, Ohio. **L-9-4**

### Investment Castings

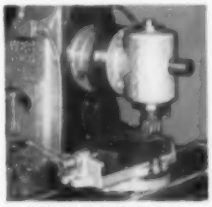
Informative, pocket size book, "How to Design Precision Investment Castings," contains process information and case histories; describes lost wax method of investment casting; also discusses in detail basic design principles as they apply to investment casting processes; materials chart lists physical properties and use of popular metals; extensively illustrated. Request directly from Midwest Precision Castings Co., Dept. TE, 10703 Quincy Ave., Cleveland 6, Ohio.

### Surface Treatment

Latest developments in surface treatment of metals presented in 84-page handbook; covers rust prevention, mechanical and chemical cleaning, blackening, phosphating and other aspects of metal surface treatment; illustrated by photos and diagrams. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa. **L-9-5**

### Air Gages

Application Bulletin AD871-1 describes various uses that have been developed for the company's Model 871 control cabinet designed originally as size control element for through feed centerless grinders. Photo and engineering drawings accompany the bulletin. Moore Products Co., H & Lycoming Sts., Philadelphia, Pa. **L-9-6**

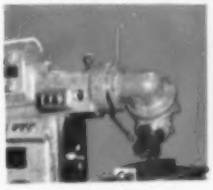
Heavy Duty Vertical Milling Attachment



Heavy Duty Offset Vertical Milling Attachment



Universal Milling Attachment



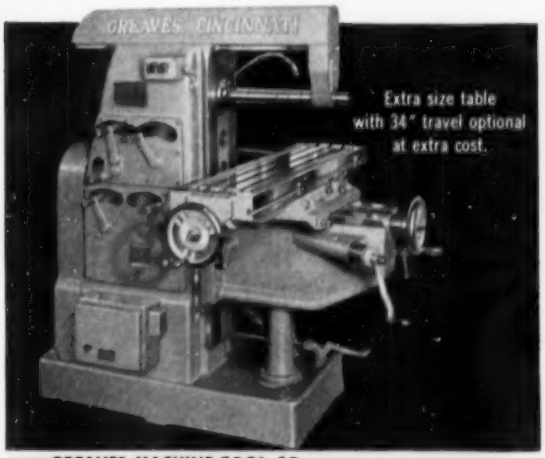
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### Investment Castings

Series of Brochures contain detailed case histories of successful investment casting applications; present panoramic view of entire investment casting field; deal with how to design, specify and buy. Request directly from Alloy Precision Castings Co., Dept. TE, 3855 W. 150th St., Cleveland 11, Ohio.

### Vertical Turret Lathes

Line of 32, 42 and 52-in. vertical turret lathes presented in extensively illustrated Catalog No. VTL-3, pointing out important features and design developments of the machines; also describes variety of attachments and optional equipment. Kaukauna Machine & Foundry Div., The Giddings & Lewis Machine Tool Co., Kaukauna, Wis. **L-9-7**

### Welding Rod

Informative 4-page Bulletin DH-1218-K gives details, covers physical properties as welded, gives analysis, tensile strength, elongation, average Rockwell hardnes and lists typical uses of gas welding rods, bare electrodes, automatic welding wire and metal spray wire. Page Steel and Wire Div., American Chain & Cable Co., Inc., Monessen, Pa. **L-9-8**

### Reamer Selection

Handy reference wall chart lists individual standard reamer sizes ranging from 0.0400 to 0.5010 in. in straight flute, right and left hand spiral plus 27 sets in fractional, decimal, wire gage, taper pin, helical die makers sizes. The DoAll Co., Des Plaines, Ill. **L-9-9**


Last word in capacity, accuracy and speed!



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**VERSATILE VERTICAL**
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**Rugged Bed-Type Table.** Has 3-way bearing. Bed 36" wide; saddle 46" long

**Convenient, Simple Operation.** Longitudinal hand-wheel in front; easily moved counterbalanced spindle and spindle head.

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18" x 52"—28" longitudinal travel
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### Epoxy Resins

Bulletin T-24 describes use of Hysol epoxy formulated resins for fabrication of foundry pattern equipment, stressing important features and advantages; gives step-by-step description of molds and simplified casting of patterns and core boxes. Houghton Laboratories, Inc., Olean, N. Y. **L-9-10**

### Threading Machine

Illustrated 8-page Bulletin H-74 contains detailed data on machine construction, design features and specifications for 5C Landmaco threading machine. Landis Machine Co., Waynesboro, Pa. **L-9-11**

### Hand Stoning

Pocket size, illustrated handbook on hand stoning tells how to obtain better finishes and increase cutting tool life with the proper abrasive stone; lists and describes special shapes, types and sizes available in natural or manufactured stones. Dept. H., Behr-Manning Co., Troy, N. Y. **L-9-12**

### Milling Cutters

Illustrated 8-page brochure emphasizes advantages of company's RC milling cutters using Throway carbide inserts; includes specification lists and drawings for various styles. Newcomer Products, Inc., Latrobe, Pa. **L-9-13**

### Angle Calculator

Twelve-page brochure explains theory, use and advantages of Trigulator, a device for solving angular calculation. Diagrams demonstrate operation. Fitch Instruments, Inc., 1480 E. High St., Pottstown, Pa. **L-9-14**

### Carbide Tools and Dies

Well-illustrated brochure describes Jaquith carbide tools and dies, explaining their development and advantages to the user. Jaquith Carbide Div. of Pratt & Whitney Co., Inc., 19 Stewart St., Lynn, Mass. **L-9-15**

### Surface Roughness

Useful 24-page American Standard booklet on surface roughness, waviness and lay, published by American Society of Mechanical Engineers, explains how to reduce machining costs and control surface finish; defines geometric irregularities of solid material surfaces and physical specimens for gaging roughness; also gives set of symbols for drawings, specifications and reports. Specifications also are provided for precision reference specimens, roughness comparison specimens and specifications for tracer type instruments. Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio. **L-9-16**

### Cutting with Abrasives

Illustrated 8-page Bulletin 5705 describes Airbrasive unit and its uses for cutting, etching, drilling, light finishing and other operations on metal, chemical, plastics and other materials by means of a high-speed stream of gas-propelled abrasive particles; includes specifications and list of components. S. S. White Industrial Div., 10 E. 40th St., New York 16, N. Y. **L-9-17**

### Agitator Selector

Dial type, pocket-size selector, called the Pneumix Capaci-Dial, automatically tells the best from 11 models of Pneumix agitators for liquid batch mixing problem. Reverse side of dial selector gives description of outstanding features of the product. Eclipse Air Brush Co., 390 Park Ave., Newark 7, N. J. **L-9-18**

### Tools

Almost 5,000 tools, including wrenches, socket wrenches, drop forged clamps, tool holders, setup and hold down tools, cutting tools and pipe tools presented in 120-page general catalog. Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 30, Ill. **L-9-19**

### Tool and Die Making

Eight-page brochure discusses means of avoiding cracking hazards in manufacture of tools and dies; gives detailed information on design, how to make the tool, heat treatment and selecting the steel; well illustrated with closeup photos to show various points. The Carpenter Steel Co., Reading, Pa. **L-9-20**

### Drafting

Well illustrated by drawings, 34-page booklet, "Time Saving Tips for the Draftsman and the Engineer," shows 59 shortcuts to speed drafting and computation work; clearly written, it shows several new approaches to old problems. Frederick Post Co., 3650 N. Avondale Ave., Chicago 18, Ill. **L-9-21**

### Lubrication Pump

Technical reference leaflet TR-57-A describes rotary piston pump for lubrication of vertical shaft machinery; discusses operation, capacities and typical mountings. Service, Bijur Lubricating Corp., 151 W. Passaic St., Rochelle Park, N. J. **L-9-22**

### Chucks

Revised general catalog No. 274 covers line of chucks for power drills and drill presses; also presents information on other products related to power drilling; includes descriptions, specifications tables and illustrations. Supreme Products Corp., 2222 S. Calumet Ave., Chicago 16, Ill. **L-9-23**


**When shape and inaccessibility makes flat-surface machining of pump housings difficult...**



**Graymills Corp. cuts costs dramatically with an**

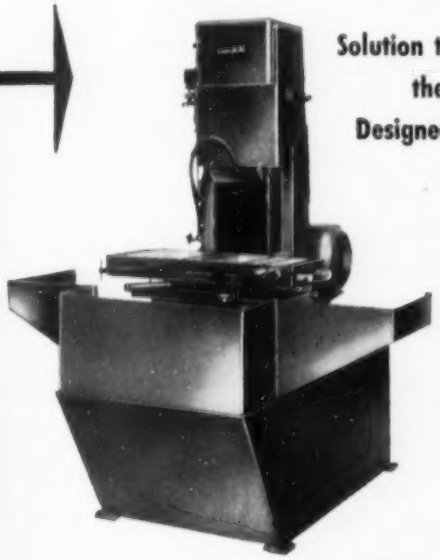
## Engelberg Abrasive Belt Grinder

The shape of the intake-discharge housing on a Graymills immersion pump makes it unsuitable for surface milling or turning on a lathe. When either method is used, pump leakage results in as much as 10% of production runs, requiring corrective machining that pushes unit costs up.

Graymills installed an Engelberg platen type abrasive belt grinder, equipped with an automatic infeed table. To this machine (the BG8-FT9 described below) Graymills attached a draw-bar air fixture developed by their own engineers, designed to handle several sizes of castings with short run flexibility and minimum setup time.

Grinding rates on the grey metal pump castings are now considerably faster than alternative methods, in spite of a 1/32" stock removal. Very satisfactory belt life is obtained with 24-grit silicon carbide running at 5,000 s.f/m., cooled by a water-soluble chemical.

In the Graymills experience, Engelberg abrasive belt grinders again prove their adaptability to specific needs . . . adaptability that is limited only by the ingenuity of the engineers who program its use.



**Solution to Graymills' Problem: the BG8A-FT9 Designed for Mass Production**

● Fast machining by wet or dry abrasive belt, backed by ground steel platen. Presetting controls rate of feed and pressure. Quick approach of ball-bearing table is followed by slower, hydraulically controlled infeed down to Micro-Stop limit. Does fine tool room jobs of surfacing, squaring, grinding angles, bevels, radii, etc.

For complete information on this and other Engelberg Abrasive Belt Grinders, write . . .

The ENGELBERG HULLER Co., Inc.
307 Seneca St., Syracuse, N. Y.

**ENGELBERG**
*Precision* ABRASIVE BELT GRINDERS

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TURNIT, makes *correct* rotation of diamond tools a simple effortless operation; saves 50% and more in diamond tool cost.

Now you can get a better wheel finish, closer work tolerance, longer wheel life and, at the same time, eliminate wheel glazing and minimize grinding wheel heat, cracks and fractures.

There is a TURNIT for almost every grinding application on all types and models of grinders. Whether you wish manual or automatic operation, internal or external installation call or write for recommendations.

For further information ask for your copy of the new Turnit bulletin.

J. K. Smit are also manufacturers of diamond tools, diamond wheels, diamond drill bits, diamond lapping compound and diamond powder.

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### Steels

More than 20 different types of carbon, alloy and stainless steel are described in 4-page Bulletin 99-1 designed as comprehensive guide to steel selection; features fast machining leaded steels and includes both bar and plate steels. Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill. **L-9-24**

### Quick Change Tools

Detailed information on complete line of quick change tools presented in 56-page Catalog No. 57; shows correct quick change holder for each of various types of standard metalworking machines which are listed by make and model number for easy recognition; also covers quick change adaptors, boring bars, boring heads, milling machine arbors, Eager Beaver face milling cutters, shell end mills and other machine tool accessories; includes engineering information pertaining to tool design. Beaver Tool and Engineering Corp., 500 W. County Rd., Gaylord, Mich. **L-9-25**

### Air Cleaner

Illustrated Catalog 357 describes operation of Aridifier—a mechanical cleaner that removed 92 percent of oil, moisture and dirt from compressed gas and air lines; illustrated by drawings. Aridifier Div., Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill. **L-9-26**

### Chucks

Tax indexed for easy reference, Catalog No. P. O. 65/1957 completely describes company's line of air operated chucks, cylinders and accessory equipment; seven sections cover chuck or cylinder descriptions, dimensions, part lists, acessories, general information and other Cushman products. The Cushman Chuck Co., Hartford, Conn. **L-9-27**

### Injection Molding

Bulletin No. 5720 describes new 20/28 oz capacity plastics injection molding machine, stressing important features and their advantages; covers complete specifications, standard and optional equipment; illustrated. The Hydraulic Press Mfg. Co., Div. of Koehring Co., Mont Gilead, Ohio. **L-9-28**

### Valve Actuator

Illustrated Bulletin A-102 describes light weight motorized actuator for direct mounting on a relief valve; pointing out features of its performance and use and main advantages; engineering drawings show application and installation. United Hydraulics, Inc., 110 Terrel Court, Dayton 7, Ohio. **L-9-29**

# abstracts of FOREIGN LITERATURE

By M. Krumenberg
Consulting Engineer

### Education for Managers

The chief engineer of a large industrial plant was asked to explain the reason for the fact that so many of the best graduates were anxious to work for him. "That is easy to explain," was his answer, "every time management wants to promote someone to a better position I submit the names of my best men. In this way everyone working for me knows that he has a fair chance for promotion even though there may not be an opening in my department. Hence, the graduates try to get into my department."

This story is reported by Th. Hafender in the Swiss magazine *Industrielle Organisation* No. 5, 1957 as an example of leading ideas in the practical education of managers, (*Forderung des Fuhrungs-Nachwuchses in Grossbetrieb*). The author gives a great number of other principles governing replacement policies and the hiring of new employees. In the same issue Fr. Streiff presents principles for promotions in the field of management, while A. Gutersohn, in a third article, discusses the same topic from the standpoint of the small and medium size factory.

### Cold Extrusion of Steel in Czechoslovakia

A report on hydraulic presses built in Czechoslovakia for the cold extrusion of steel appears in issue No. 5, 1956 of *Czechoslovak Heavy Industry* authored by Olaf Stepanek. Originally these presses were intended for working plastics but have now been adapted to cold extrusion of steel.

The author describes the production of nuts for the automotive industry. Forty-five percent of the material is saved in comparison with older methods. The author goes into great detail of the tool design for simultaneous piercing of the bore and of the hexagonal outside of the nut. He also describes the presses used. He indicates that they must be rigid. A pressure of 120 to 125 tons is required for the cold




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(1) **Greater lubricity** for more efficient chip clearance.

(2) **Reduced galling** that prevents loading on margins.

(3) **Strain reduction** that lengthens tool life.

(4) **Added toughness** that means less breakage.

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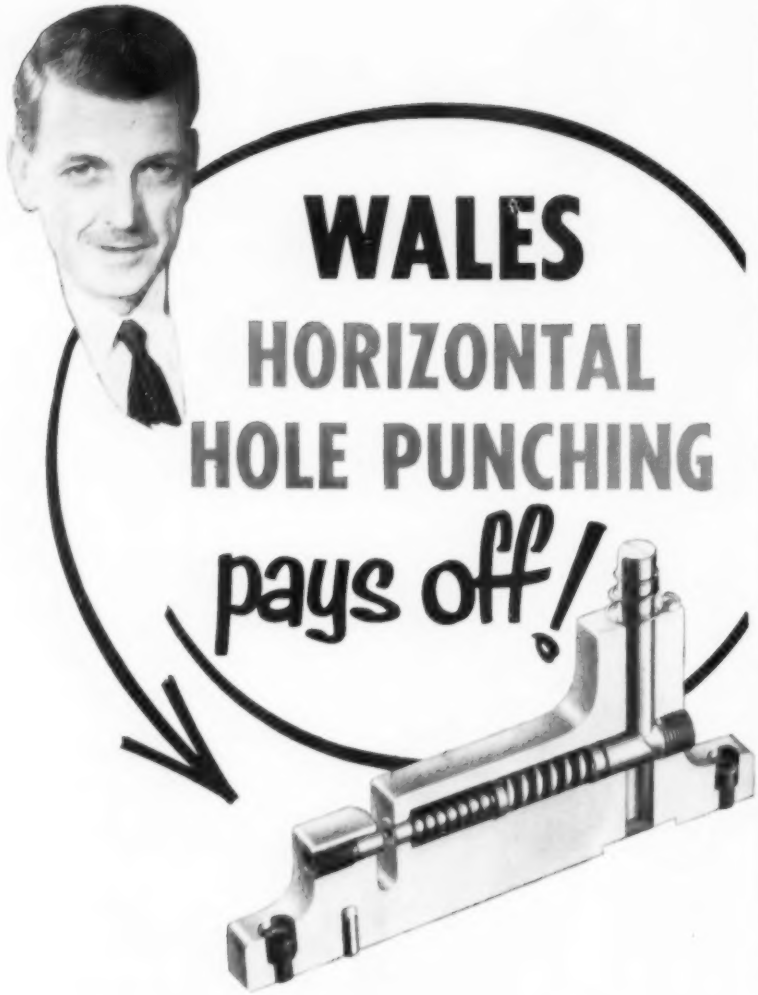
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Punching holes in any kind of flange, angle, channel or shape is usually a costly operation requiring custom dies, but not with WALES Standard H Tooling. This exclusive self-contained tooling equipment, with interchangeable punch, die and stripping mechanism makes possible fast, economical hole punching. WALES H Tooling insures FAST set-up with automatic alignment and the same equipment may be used over and over again in any number of patterns. Bench assembly virtually eliminates press down time. H Tooling is available to meet your every production requirement.

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extrusion of a nut made of a steel of about 65,000 psi tensile strength. The nuts must be annealed after extrusion in order to restore the original structure of the material. When several millions of nuts are made yearly it is possible to make the entire process automatic.

### Ceramic Tools in Russia and Czechoslovakia

A review of an article by J. Peklenik is published in *Stahl und Eisen* No. 12 of June 13, 1957, covering research and experience in the machining of metals with ceramic tools in Russia and Czechoslovakia. The Russian material is called "Mikrolit." Grain size, specific weight, compressive strength and other physical quantities are discussed. Tool life tests were run using ceramic tips when turning carbon steels of about 100,000 psi (approx. equivalent to SAE 1045) using different feeds and depths of cut. The author also measured the relationship between chip compression, cutting speed and feed. He developed standards for the tool geometry. Milling operations are discussed, where cutters equipped with ceramic tips milled soft steels and cast iron in the range of 180 to 200 Brinell.

Another article on ceramic tools appeared in *Technik und Betrieb* 1957, vol. 9, pages 35 to 37. It is published by K. R. Pawlowitz under the title *Neue keramische Schneidwerkstoffe*. A survey of the properties and cutting conditions is given, with a section on grinding techniques. The author recommends using diamond wheels for finishing after grinding the tips on two different silicon carbide wheels.

### Clamped-On Chip Breakers

Clamped-on chip breakers, which are relatively less common in Europe than in this country, have been studied by M. E. Mueller. A report is published by the Machine Tool Laboratory of The Swiss Institute of Technology in issue No. 6, 1957 of *Werkstattstechnik und Maschinenbau*. The title of the report is: "Die Beherrschung der Span form beim Drehen."

After discussing the advantages and disadvantages of chip breakers ground into the tool, the author presents the advantages of clamped-on chip breakers. They permit free choice of feed and depth of cut for breaking the chips, by changing the distance of the breaker plate from the cutting edge.

Tests have shown that a relationship exists between the chip thickness and the distance from the cutting edge to the clamped-on breaker plate. The smaller this ratio, the better the chips are broken.

The smallest distance found acceptable for breaking chips is about 6 to 7 times chip thickness. Best results are

obtained when the distance is about 8 times chip thickness. Longer spirals are produced when the ratio is 9:1 to 10:1. Snarling chips result with a ratio of 12:1.

In addition to this ratio, the heel angle has an effect on the chip breaking also, although less pronounced. It should be between 50 and 70 degrees. Tool geometry, work material, cutting speed and feed likewise enter into the breaking of the chips because of their effect on the chip thickness.

The shape of the chip cross sectional area—that is the ratio of depth of cut to feed—should not exceed 20:1 for good chip breaking.

The author further indicates that cratering of the tool face increases when clamped-on chip breakers are employed. This is due to the fact that the area of contact between chip and tool face is reduced and thus the heat more concentrated. The tests resulted in a diagram showing a drop in the depth of the crater with increasing ratio of distance of the plate from the edge to chip thickness. Tool life, however, is not substantially affected if the chip breaker is designed for a ratio 8:1, except in cases of high cutting speeds.

### Drilling Research

The old topic of reducing the web thickness of twist drills for improved drill performance has again been made the subject of an investigation, as reported by G. Bruegman in *Fertigungstechnik* Vol. No. 5, No. 11, pages 483 to 494. The author refers to the work of three Russian researchers Shirow, Ryshkow and Klemm who have developed a new web for the twist drill.

The article covers comparisons with drills with normal points. It discusses the requirements of the various machining quantities such as feed, speed, diameter and tool life for which formulas have been developed. The second part deals with large feed rates with drills having an additional angle of 70 deg at the outer portion of the main cutting edges over a width of two tenths of the diameter. A so-called cross-cross grind point developed by Klemm made it possible to increase the feed from about 0.010 ipr to 0.019 ipr. An additional increase in metal removal capacity was obtained by combining the cross type point with the additional angle mentioned above.

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**Electronic** Associates, Inc. has opened its European Computation Center Rue de la Science 43, Brussels, Belgium. The center specializes in education in analog computer techniques, consultation service in application of analog computers, and rental of time on the center's computer system.

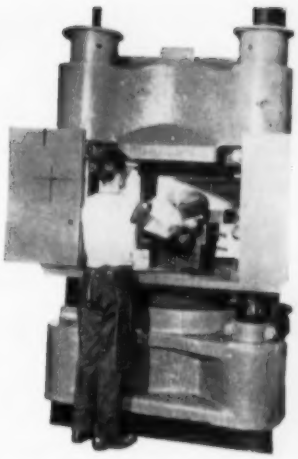

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Cracks in main cylinder of powder-metal press at Amplex Division of Chrysler Corp. halted vital production. The independent repair firm called in chose PLASTIC STEEL to plug holes.

PLASTIC STEEL B was forced into casting cavities — PLASTIC STEEL A was used to patch leak in base. Result — full operation in a week at less than $1000 cost. No further leakage developed.



PLASTIC STEEL (80% steel — 20% plastic) has saved weeks of lost production and thousands of dollars. PLASTIC STEEL A is like putty . . . PLASTIC STEEL B can be poured — both harden like steel in two hours. 1001 uses . . . repair and rebuild machinery, tanks, valves, etc., with PLASTIC STEEL. Bonds to practically any material. Write today for 8-page brochure, showing how PLASTIC STEEL can save countless hours and dollars throughout your plant.

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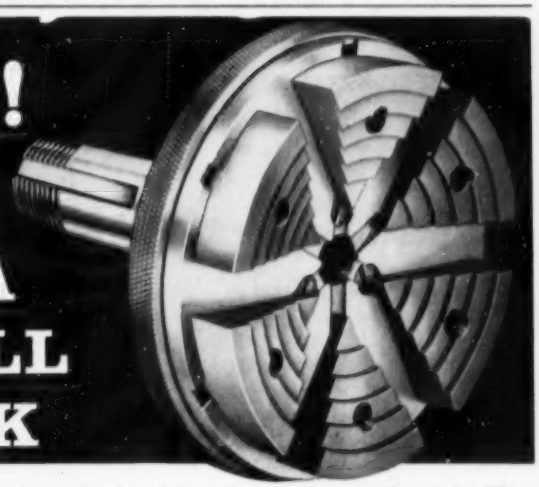
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# who's meeting and where

**Oct. 6-8.** Fluid Controls Institute, Inc. Fall meeting, Westchester Country Club, Rye, N.Y. Obtain further information from institute office, Box 191, Decatur, Ill.

**Sept. 8-11.** National Metal Trades Association. Eastern plant management conference, the Claridge Hotel, Atlantic City, N. J. Write association headquarters, 337 W. Madison St., Chicago 6, Ill., for more information.

**Sept. 8-13.** Investment Casting Institute. Second annual course on investment castings, Massachusetts Institute of Technology, Boston, Mass. Contact society headquarters, 27 E. Monroe St., Chicago 3, Ill. for more data.

**Sept. 9-13.** Instrument Society of America. 12th annual Instrument Automation conference and exhibit, Cleveland Auditorium, Cleveland, Ohio. Further information on exhibit is available from exhibit manager, Fred J. Tabery, 3443 S. Hill St., Los Angeles, Calif.; details of technical program may be had from Herbert S. Kindler, director of technical programs, ISA, 313 Sixth Ave., Pittsburgh, Pa.

**Sept. 9-13.** Massachusetts Institute of Technology. Special summer session on precision investment castings for those who have had practical experience in the field; will include lectures, laboratory exercises and demonstrations. Direct inquiries to Office of the Summer Session, Room 7-103, M.I.T., Cambridge 39, Mass.

**Sept. 9-20.** North Carolina State College of Agriculture and Engineering, University of North Carolina. Two week linear programming short course. Request further information from College Extension Div., N. C. State College, Raleigh, N. C.

**Sept. 17-18.** Radio-Electronics-Television Manufacturers Association. Symposium on numerical control systems for machine tools, Ambassador Hotel, Los Angeles, Calif. Obtain more facts from association headquarters, 11 W. 42nd St., New York 36, N.Y.

**Sept. 17-20.** American Die Casting Institute. Annual meeting, Edgewater Beach Hotel, Chicago, Ill. Institute office, 366 Madison Ave., New York 17, N.Y., can supply other facts.

**Sept. 22-24.** American Machine Tool Distributors Association. Annual meeting, Hotel Cleveland, Cleveland, Ohio. Send inquiries to association office, 1900 Arch St., Philadelphia 3, Pa.

**Sept. 23-24.** Steel Founders' Society of America. 55th fall meeting. The Homestead, Hot Springs, Va. Details are available from society office, 606 Terminal Tower, Cleveland 13, Ohio.

**Sept. 23-25.** The American Society of Mechanical Engineers. Fall meeting, Statler Hotel, Hartford, Conn. Write society office, 29 W. 39th St., New York 18, N.Y. for details.

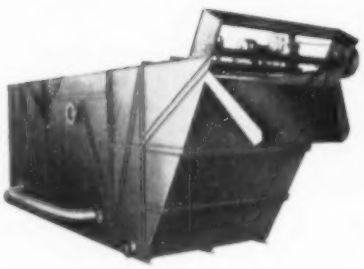
**Sept. 23-25.** Standards Engineers Society. Sixth annual meeting, Hotel Commodore, New York, N.Y. Request more information from society office, P. O. Box 281, Camden, N.J.

**Sept. 23-26.** Association of Iron & Steel Engineers. Annual convention, Penn Sheraton Hotel, Pittsburgh. More facts may be had from association office, 1010 Empire Bldg., Pittsburgh 22, Pa.

**Sept. 24-25.** Industrial Electronics Symposium, sponsored by Institute of


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Radio Engineers Professional Group of Industrial Electronics, American Institute of Electrical Engineers and the Chicago sections of IRE and AIEE. Morrison Hotel, Chicago. Send inquiries to E. A. Roberts (IRE) Union Thermoelectric Corp., 2001 Greenleaf St., Evanston, Ill., or H. L. Garbarino (AIEE), Armour Research Foundation of Illinois Institute of Technology, 10 W. 35th St., Chicago 16, Ill.

**Sept. 29-Oct. 3.** National Screw Machine Products Association. Fall meeting, Broadmoor Hotel, Colorado Springs, Colo. Write association office, 2860 E. 130th St., Cleveland 20, Ohio, for details.

**Sept. 30-Oct. 1.** Material Handling Institute, Inc. Joint industry fall meetings, Greenbrier, White Sulphur Springs, W. Va. For more facts, contact institute office, One Gateway Center, Pittsburgh 22, Pa.

**Oct. 1-5.** Society of Automotive Engineers. Aeronautic meeting, aircraft production forum and aircraft engineering display, Ambassador Hotel, Los Angeles, Calif. Society office, 485 Lexington Ave., New York 17, N.Y., can supply details.

**Oct. 4-5.** American Ceramic Society. Refractories division meeting. Bedford Springs Hotel, Bedford, Pa. More information may be had from society headquarters, 4055 N. High St., Columbus, Ohio.

**Oct. 6-9.** Electrochemical Society Inc. Fall meeting, Hotel Statler, Buffalo, N.Y. Write to society, 216 W. 102nd St., New York 25, N.Y., for more data.

**Oct. 7-9.** Illinois Institute of Technology. National electronics conference, cosponsored by two other universities and two technical societies, Hotel Sherman, Chicago, Ill. Send inquiries to Raymond D. Meade, conference coordinator, IIT, 3300 S. Federal St., Chicago 16, Ill.

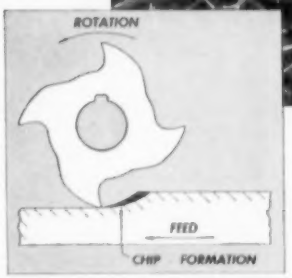
**Oct. 7-9.** American Society of Lubrication Engineers and American Society of Mechanical Engineers. Joint lubrication conference, Royal York Hotel, Toronto, Ont. Further information may be obtained from William P. Youngclaus, Jr., administrative secretary, 84 E. Randolph St., Chicago 1, Ill.

**Oct. 9-11.** Gray Iron Founders' Society Inc. Annual meeting, Drake Hotel, Chicago, Ill. Complete details may be obtained from society office, National City-E. 6th Bldg., Cleveland


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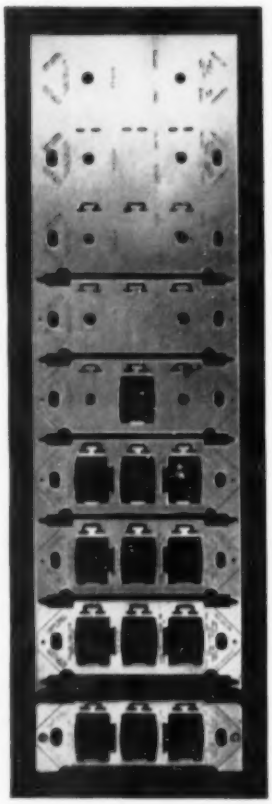
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**Oct. 13-17.** Pressed Metal Institute. Annual meeting, Castle Harbor, Bermuda. Direct inquiries to institute headquarters, 3673 Lee Rd., Cleveland 20, Ohio.

**Oct. 17-18.** Armour Research Foundation and Illinois Institute of Technology, sponsoring national conference on industrial hydraulics, Hotel Sherman, Chicago, Ill. Inquiries may be sent to Raymond D. Meade, conference coordinator, IIT, 3300 S. Federal St., Chicago 16, Ill., or conference secretary of ARF, 10 W. 35th St., Chicago, Ill.

**Oct. 24-25.** Engineering Institute on Effective Drafting, University of Wisconsin, Dept. of Engineering, Madison, Wis. Primarily aimed at helping chief draftsman become a better supervisor and to better organize his department. For details contact Robert A. Ratner, director, engineering institutes, The University of Wisconsin, University Extension Div., Dept. of Engineering, Madison 6, Wis.

**Oct. 27-30.** American Gear Manufacturers Association. Fall meeting, Edgewater Beach Hotel, Chicago. Send for other information to One Thomas Circle, Washington 5, D.C.

**Oct. 27-31.** Atomic Industrial Forum and American Nuclear Society. Annual meeting and trade fair of the atomic industry, Plaza Hotel and New York Coliseum, New York, N.Y. Details are available from Atomic Industrial Forum, 3 E. 54th St., New York 22, N.Y.

**Oct. 28-31.** Society of Industrial Packaging and Materials Handling Engineers. National Industrial Packaging and Handling Exposition, Convention Hall, Atlantic City, N.J. Contact the exposition management, Hanson & Shea, Inc., Suite 759, One Gateway Center, Pittsburgh 22, Pa.

**Oct. 30-Nov. 3.** National Tool & Die Manufacturers' Association. Annual convention, Edgewater Beach Hotel, Chicago, Ill. More details may be had from association headquarters, 907 Public Square Bldg., Cleveland 13, Ohio.

**Nov. 2-8.** American Society for Metals. National Metal Exposition and Congress and annual meeting, International Amphitheatre and Palmer House, Chicago, Ill. Second World Metallurgical Congress also will be held in conjunction with this meeting. Society office, 7301 Euclid Ave., Cleveland 3, Ohio, can supply details.

# technical Shorts

### Develop Transistorized Computer

AUTOMATIC CONTROL is provided for industrial process plants as a result of development of an advanced digital control computer by the Ramo-Wooldridge Corp. The fully transistorized computer, known as the RW-300, is specifically designed to automatically control such processes as chemical manufacturing, metals processing or oil refining. The computer also can be used for general purpose scientific computation and to perform monitoring function on a data logger. According to officials of the company's Computer System Div., the computer, when used as a central unit of a process control system, will automatically read process instruments, perform computations necessary to relate these readings to process objectives, determine control actions that will result in best plant operation, and activate process mechanisms or adjust set points on supervised control loops.

* * *

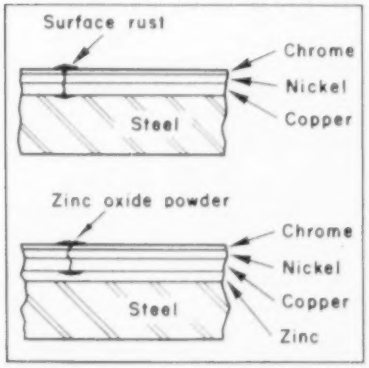
### Plating Process Prevents Rust On Chromed Steel

LABORATORY TESTS of a new plating process indicate that rust forming on chrome plated steel surfaces may no longer be a problem. Now field tests are being conducted by a research organization to check this process developed by Wagner Bros. Inc. Basically, the method involves use of a zinc base plate in the copper-nickel-chrome plating sequence.

According to Bruno Leonelli, director of research for Wagner Bros., the zinc base-plate principle has been common knowledge throughout industry, but its successful application to the copper-nickel-chrome sequence was delayed because of the affinity between zinc and copper. This affinity results in molecular blending of the zinc and copper layers which creates a gap between the surface of the part and the plating metals. Such a gap results in rapid cracking and peeling of the plated surface.

The new plating process apparently prohibits the molecular blending of the zinc and copper plating layers. Consequently no subsurface gap is formed and there is no possibility of surface cracks and peeling caused by such gaps.

Tests so far conducted involved exposing a number of steel parts plated by the new method to a 20 percent salt spray bath at 100 degrees centigrade for a 192-hour period with no visible evidence of rusting, blistering, cracking or peeling. Such test conditions caused conventionally plated parts to show blemishes after 48 hours.









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AUTOMATION IN BUSINESS AND INDUSTRY —*Edited by Eugene M. Grabbe. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $10. 632 pages.*

This book combines the talents of twenty-one prominent engineers and scientists in presenting the present status of developments and applications in the field of automation.

As automation today is applied on a broad scale to control systems ranging from top management to individual machines, a unifying process becomes apparent through the fields of feedback control theory, instrumentation, analog and digital computation, and data processing. Considerable attention is focused in this volume on electronics, computers and data processing. The chapters are so arranged that the components are treated early in the book and systems later on.

The converging points of business and science, automation's impact on the social scene, and human error as it affects machine reliability are only a few of the sidelights growing out of the over-all discussions.

A profusion of valuable details enter the discussions although the book is general, rather than technical, in approach.

MACHINE DESIGN, 2ND EDITION—*By Paul H. Black. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $7.50. 471 pages.*

This book is intended to serve as a textbook for courses in general machine design and as a reference book in mechanical design offices.

It is a concise analysis of the problems of machine designing that combines careful treatment of detail with a rational approach to design problems—

a practical treatment based on tested, scientific data and experimental findings. There is a complete discussion of each phase of machine designing from adaptability and selection of materials to elimination of vibration.

Problems at the back of the book are representative of the field covered and each problem is based on an actual installation with emphasis on the design type problem rather than the analysis type.

WORK, WORKERS AND WORK MEASUREMENTS—*By Adam Abruzzi. Published by Columbia University Press, 2960 Broadway, New York 27, N. Y. Price $7.50. 336 pages.*

Dr. Abruzzi first looks into work measurement practices in their classical setting. His view is that these practices fail to do the job that must be done for the effective operation of modern industry. The difficulty arises because the estimating function is confused with the evaluation function. Because of this, classical practices perform neither of these functions well. The result is a "game" between management and labor that can aptly be described within the framework of the Von Neumann theory of games.

Both labor and management are directly concerned with standards and how they are established. As standards are the result of "value judgments," the result is estimates that are blindly favorable either to management or labor. Describing how bargaining games over production standards can be improved is one of the primary objectives of this book.

Some other points of interest are work measurement procedures, job shop problems, worker fatigue and work skill.

In the closing chapter Dr. Abruzzi expands on the automatic factory and its problems and influence on society.

HANDBOOK OF HYDRAULICS, 4TH EDITION—*By Horace W. King and Ernest F. Brator. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $8. 567 pages.*

This Handbook covers every phase of common practice as well as many special problems. It condenses and simplifies rules and formulas; it clearly explains the practical application of all the many tables and diagrams. Full use of dimensional analysis in arranging these tables results in their particularly useful and compact form.

The book is a time and trouble-saving reference work, giving the basic formulas, tables and data used in hydraulic engineering, plus detailed methods of applying them to the solution of problems.






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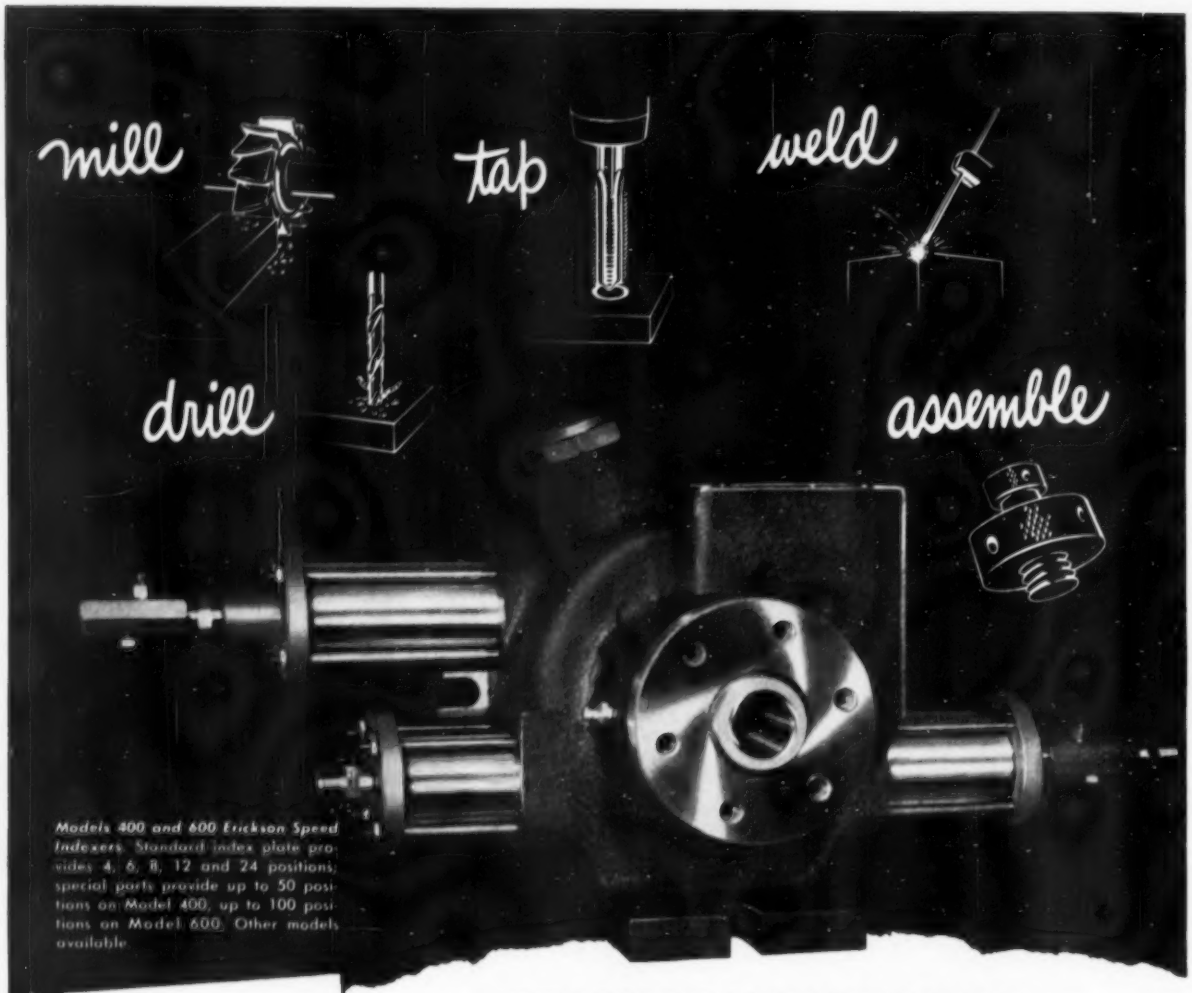
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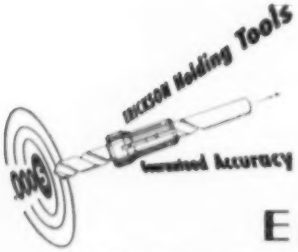
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Tech Digests

# Automatic Gaging by Tape Control

By W. S. Tandler
Warner & Swasey Research Corp.
New York, N. Y.

MILITARY PRODUCTION requirements for parts of extreme complexity designed to closest tolerance that can be produced have made it necessary to gage these complex parts economically and at a fairly rapid rate. This has led to the development of a number of high-precision measuring techniques which are solving these problems. With these it is possible to correlate measuring the results, compute them and come up with an over-all answer.

There are two approaches possible: one is the graphic technique; the other, automatic computation, which may result in numerical presentation or in automatic segregation. A machine has been developed which combines both techniques. It first measures automatically, computes results and decides whether to accept or reject in accordance with set tolerances incorporated into the machine. If the decision is to accept, no further action is taken. If the decision is to reject, however, the automatic machine records all measurements in the form of a deviation chart so that this can serve as a rejection report.

Over a number of years a technique has been developed in which measurements are taken by electric contact, not by spark, and correlated by precision slides. This technique is free of the age-old problem of pressure distortion and lends itself to automatic operation. This is the basis of the Probograph, *Fig.* 1.

To establish and successfully utilize the Probograph technique, a basic concept of part design had to go along with it, namely coordinate dimensioning. This is not only a basic requirement of automatic measurement of complex parts, it is a basic requirement of automatic computation. With this system parts having a large number of surfaces and dimensions, some of which must be closely correlated by tight tolerances, can be quickly measured and an answer secured within a matter of seconds.

Where only relatively small quantities or even single parts are to be inspected a single-probe machine, *Fig.* 2, performs the measuring operations consecutively instead of simultaneously. Measuring operations are programmed. The program is put on punched tape containing the digital numerical data required, *Fig.* 3. This data falls into two groups: (1) positioning data, points at which measurements are taken; and (2) measuring data, i. e. the dimensions



**Fig. 1. Tape-controlled automatic inspection machine checking impeller wheel. At right is control unit containing tape controls and recording unit which charts the inspection results.**

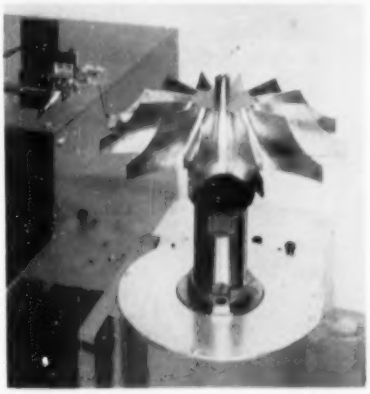


**Fig. 2. Close-up of impeller wheel showing position of probe holder in relation to vanes being measured for curvature. The probe holder is mounted on an arm which extends from the measuring head. To check the part the probe is moved by program control to positions and measuring points indicated by the print. A rotary fixture holds the part during gaging, repositioning it as necessary.**

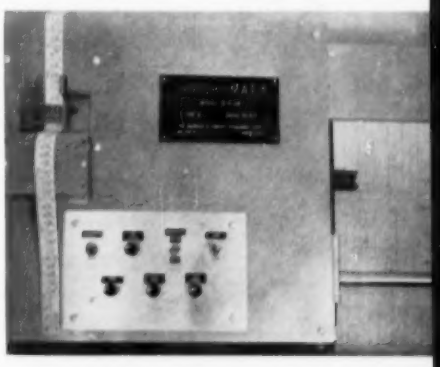


**Fig. 3. Close-up of control unit showing record chart and tape reader. A recording is made on the strip chart, which advances a small step for each measurement. Styles cluster is at left.**




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which the instrument should read at a given position. The machine, besides automatically positioning, also operates with the nominal dimensions of the part and in its operation automatically compares the nominal with the actual dimensions. The difference between nominal and actual dimension is the error. This error is recorded or used for computation, or both.

Development of a fully automatic tape control positioning and measuring system has led to a most significant consequence. The same controls that are applicable to positioning for measuring are also suitable for machine tool controls. For instance, with this system, the same tape information can be used to operate a jig borer in making the part and for inspection. The tape prepared for the automatic control of a jig borer is converted to another tape for use on the automatic measuring machine. The two tapes contain the same basic information, both command and digital type. There only are minor differences due to the nature of the machine process and the measuring process. Conversion from one tape to the other requires only a fixed set of rules and not the thinking and decision of a human operator.

In the automatic gaging a considerable number and variety of complex parts have been successfully inspected. These fall essentially in two categories: (1) contoured parts, and (2) noncontoured surfaces, flats, cylindrical forms, and holes.

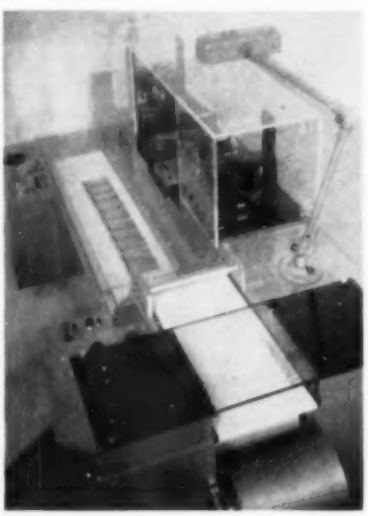


**Fig. 4. Top view of Airfoil Probograph showing blades for inspection, probe banks and holding fixture, center right, and recording strip in foreground.**

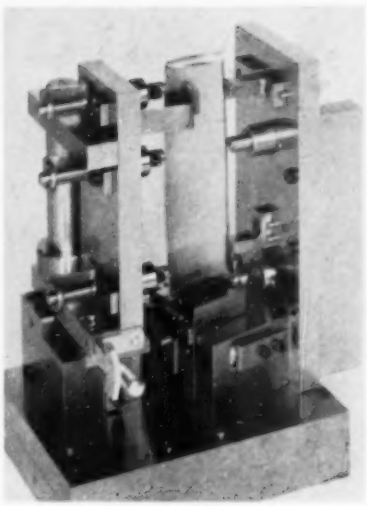


**Fig. 5. Blade holding fixture for multiprobe inspection machine, with compressor blade in position.**

Among noncontoured complex parts are housings, gear housings, turbine, compressor and pump housings, shafts, and many other parts. The close control and inspection of concentricity and alignment of bores, spacing of holes and their relation to other surfaces on the same piece is one of the exacting jobs most appropriate for this system.

In the multiprobe machines, elaborate tooling setups may be used, *Figs.* 4 & 5. Measurements are taken at 40 or 50 points simultaneously. In this way, it is possible to inspect large quantities of turbine blades, compressor blades, etc., in a short period of time.

The measuring results are automatically computed and a green light signifies acceptance, a red light rejection. The machine contains tolerance units which are adjustable to specified requirements. If all measurements of a blade are within the set tolerances, the machine accepts the blade by showing a green light. If any deviation is outside tolerance, the machine rejects the blade by showing a red light. In this case it automatically repeats its measurement and records all measuring deviations on a strip chart.

No record is made of good blades, however, the machine can be set to record all or any blade, if desired. The strip chart roll is stored on the right side of the machine, the chart extends under the stylus unit, comes down the slanted portion and stretches over the whole length of the machine to permit clear and easy observation. The probe

banks mount the forty probe holders, which are set by pin masters to the precise nominal contour of the blade. The blade is held in the holding fixture visible between the probe banks.

Thus it is seen with these two types of machines, it is possible to inspect complex parts either for small production or mass production. In small production these methods are obviously especially advantageous because of the close relation of the tape controlled gaging technique with tape-control production.

Because small production means frequent changes and flexibility of equipment, tape control is one of the greatest steps forward in attaining automatic equipment which at the same time is flexible. The equivalent part in mass production is played by transfer machinery. While the inspection problem of tape-controlled machine production can be solved by tape control gaging, inspection problems of mass production can be solved by tooled automatic computing and recording gaging machines.

All of the gaging methods described are applied to the part after it leaves the production machine. The reason that in-process gaging is not attempted, is that with complex parts feedback correction is not likely to be practical in the near future. With automation of gaging of complex parts, it will be possible for inspection not only to keep pace with automatic production methods but, perhaps even to gain the lead.

From a paper given before the 1957 National Convention of the American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee 3, Wis.

▼ ▼ ▼

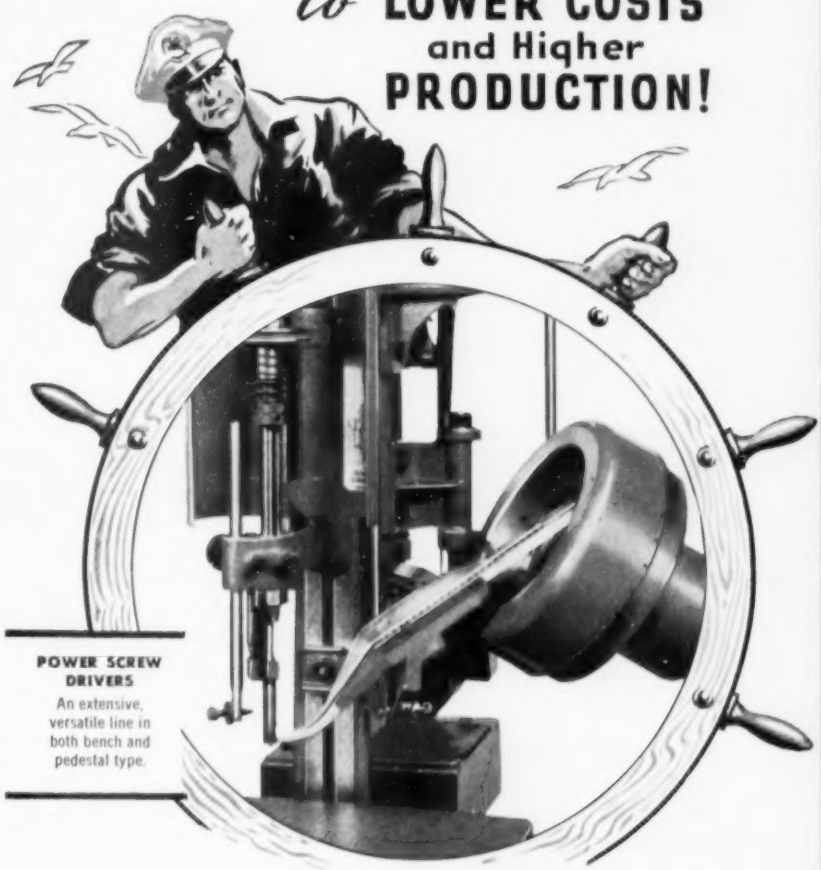
## Cutting Packaging and Handling Costs

**By E. K. Gustin**
Packaging Engineer
**A. O. Mooney**
Traffic Manager
and
**A. S. Love**
Manager, Aircraft Service Parts

**Bendix Aviation Corp.**
**South Bend, Ind.**

Materials handling and packaging are two of the most promising—and most neglected—areas for reducing production costs. In many companies, nearly 50 percent of the production operation is concerned with the han-


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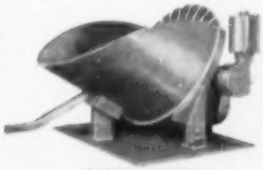
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dling of incoming materials and the movement of finished packaged goods to the factory door. This segment needs to be re-examined continuously if a product is to remain competitive. If it is possible to reduce the cost of prepackaged vendor items, decrease shipping charges, lessen manual handling of material during all operations, conserve warehousing space, minimize inventory, and provide better packaging at economical costs, profits will increase. Some companies, like Bendix, that have integrated and coordinated packaging, materials handling, warehousing, receiving, shipping, and transportation have saved from $36,000 to $500,000 a year.

This is one of the principal reasons why packaging at Bendix is a function of the traffic department. The choice of traffic to coordinate packaging activities also reflects growing concern with freight costs. Packages developed with full knowledge of traffic considerations sometimes pay for themselves in freight savings. For example, palletizing rough steel stampings weighing less than 15 pounds instead of shipping them loose has saved more in freight costs than the containers cost. Substitution of other materials for wood in a container for shipping an aircraft component paid for the container by reducing the freight per piece 40 percent in another case.

Handling of incoming materials has been improved by increased use of palletization and by cooperative efforts with suppliers to standardize their packaging or tailor it to Bendix's materials-handling facilities. As a result, 30 percent more material is being received with a third less manpower—and with less operator fatigue. Palletizing has reduced the time required to unload a truck from more than 20 man-hours to 20 or 30 minutes and has reduced boxcar demurrage from about $100 a month to less than $150 for the last four years.

Savings also are being obtained from automatic packaging machinery and from use of wire-bound pallets. Because of palletizing, the shipping department is no longer a bottleneck. Fewer man-hours are needed to pack shipping containers; the cubic displacement in the containers has been reduced, with indirect savings in payload weight; and fewer cartons are needed—950 in January 1957, compared to 6500 in January 1956. Other advantages include relative ease of stacking, mobility, and light weight.

From a symposium on industrial packaging given at the National Packaging Conference of the American Management Assn., 1515 Broadway, Times Square, New York 36, N.Y.

▼ ▼ ▼

## How Computers Save Engineering Time

**By D. H. Ware**
**W. J. Martiny**
**and**
**F. J. Maginniss**

**General Electric Co.**
**Schenectady, N.Y.**

In addition to many applications in accounting and business, electronic-data-processing machines, are giving new opportunities in all activities of engineering. These range from research and development studies, major design planning, production-engineering design calculations, through documentations of engineering information and generation of manufacturing instructions.

In production engineering many calculations are made on special products scheduled in small quantities. The calculations are usually lengthy and involved. By reducing the longer calculation procedures to a program for an electronic calculation machine, a standardization of procedure is forced such that all calculations made in this manner will be complete and always based on the same premises and assumptions. This standardization enables a fairly rapid comparison of the results of test against design.

In many cases a shortage of engineer-

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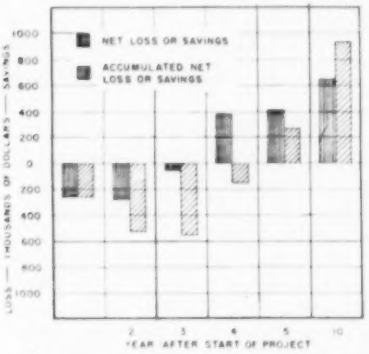
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ing manpower may compel the use of electronic computers to extend competent decision-making to the less experienced engineers without sacrificing freedom of action yet maintaining assurance of satisfactory performance.

Engineering documentation and generation of manufacturing instructions are quite similar to most production and manufacturing activities. The use of electronic equipment in this field is accompanied by all the advantages one would find in such operations as accounting. Specifically a certain amount




**Cash flow for a large project on electronic-data-processing equipment.**

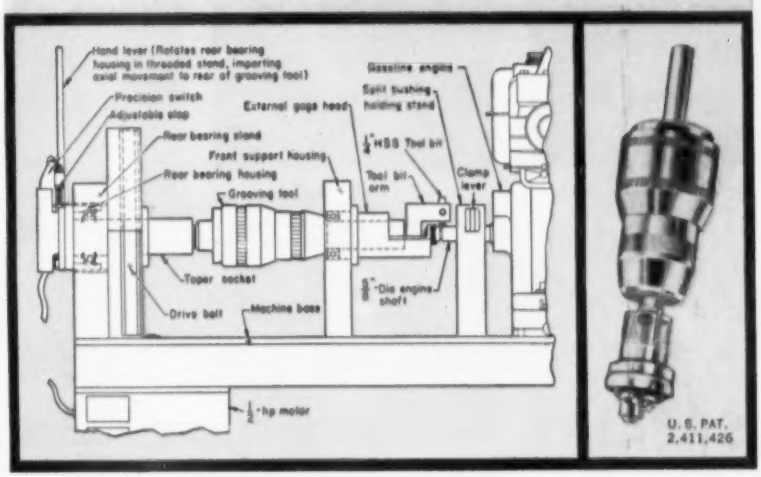
of inventory control is gained through electronic-data-processing machines by using cross-checking programs to eliminate, for example, the possibility of two drawing numbers or two model numbers for the same part.

This equipment has the advantages of being able to feed back to engineering management any reports on the types of specialties which are being sold or products or parts being built in sufficient quantity to justify some sort of standardization or extra design effort to reduce variety.

One of the most important advantages to management is that it permits much more widespread and effective use of computers in all of the functions other than engineering. Most of the identifying information for parts, subassemblies, and complete units are generated by the engineering organization. Once these identifying numbers are made suitable for use on electronic equipment, any of the other functions would be able to use these numbers directly and not be obliged to provide conversion routines or abbreviations of numbers which may become so complex as to make the whole process unwieldy.

Savings, in an actual project of applying a fairly complex set of problems and the related communication system, are shown in the accompanying chart.


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To install a small gear, Clemson Bros. must machine a recess (Tolerance: +.033" —.000") in a shaft of the engine for their power lawn mowers.

Engines arrive fully assembled. Normal procedure was to rotate the shaft. That involved removing a spark plug, mounting each engine firmly and accurately on a lathe, securing a gear or sprocket on the shaft, driving the shaft and moving the stationary cutting tool into position. The engine had to be reassembled after grooving.

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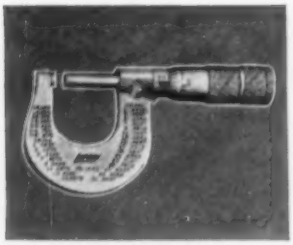
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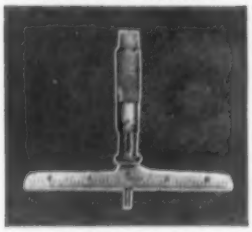


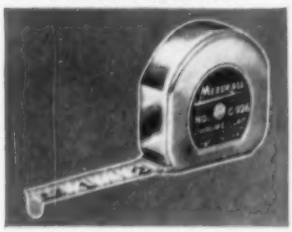
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One set of bars represents annual net costs or savings, as compared to a manual system, for specific years after the start of the project. The other set represents the same data on an accumulated basis. The use of electronic-data processing equipment offers high returns, but must be supplemented by substantial investment in training, effort, time, and money.

From a paper given at the 1957 Engineering Management Conference, American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y.

▼ ▼ ▼

## Role of Materials Handling in Automatic Production

**By James R. Bright**
**Associate Prof. of Business Administration**
**Harvard University**
**Cambridge, Mass.**

Productivity increases principally because of greater capacity, higher speed, increased precision and reduced dependency upon manpower. Today's production systems, whether labeled automated or not, lean more and more on nonmanual devices for guidance and control.

Because of current trends to automatic production, the span of mechanization is increasing. Regardless of the presence or absence of complex forms of control, it is clear that as more activities are mechanized, the percent of nonmanual operation grows.

From a bird's-eye view, automaticity is spreading across the total production sequence. It may appear as (a) a series of unconnected islands of automatic operation; (b) as an integrated production system, the printing of news-

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papers, for instance; or (c) it may be a thread of automaticity running through the production sequence with various combinations of mechanized and manual action clustered around the work stations, as in power-and-free conveyor lines.

Regardless of which of these evolution paths is followed, the various pieces of machinery tend to blend into an integrated whole. The machine units become longer; fewer manual actions, hence fewer operators, are required.

Centralized control extends nonmanual direction of action across a larger span of the production system. Program control extends nonmanual direction over a longer period of time. The effect is to reduce the frequency of human attention. It also results in a precision of machine action that is beyond human skill in many cases.

## Mechanization Growing

Thus, the level of mechanization in a great many individual operations or activities is climbing toward a more sophisticated machine action.

The rising level of mechanization reduces the proportion of human control and leads to control of one machine in terms of another's performance or requirements. As a whole, then, the production system is becoming more of a self-sufficient machine entity.

Although the units of machinery are growing larger through consolidation and expansion of mechanization, there is a notable reduction in the over-all size of the production system.

These machinery trends mean that there are fewer production line operators per unit of output. Such operators as remain do less and less of the physical act of production. The operator becomes more of a patroller, a monitor.

Mechanization is not only extending to the physical activities in the plant. Tomorrow it will be applied at increasing rate to information collection and analysis tasks. Many of these will be related to material handling activities. In particular, the storage of inventory stock records and the maintenance of these records as additions and withdrawals are made, is being mechanized.

It is only a step to link such mechanized record-keeping activities to the control of the mechanized warehouse and a mechanized production system. Ultimate results may appear in only a few plants and then at a considerable time in the future. There will be, however, more and more activities controlled by and through information and instructions collated and issued by the computer.

These trends set forth the nature of the factory to come. This factory is an integrated thing, highly conveyorized with production equipment so intimately assimilated into the conveyor, and vice versa, that it is hard to tell where one starts and the other stops. Where such automated lines exist, there is no need and no place for a conventional materials handling man. Random intermittent movement and storage of materials throughout the plant will be minimized more and more by these integrated, continuous flow systems.

Suppose that the materials handling man takes the initiative in developing continuous flow, in forcing integration of handling and manufacturing, in pioneering tomorrow's highly productive manufacturing systems? Suppose he explores the ramifications and possibilities of mechanized information handling in the factory and the warehouse?

This kind of a materials handling man need not be concerned about his future. It couldn't look better! For where else in the firm is there someone who has the opportunity for over-all perspective of a firm's primary activity —getting raw materials in one door and finished goods out the other.

---

From a paper "The Long Range Outlook" given at the National Materials Handling Exposition and Conference, Philadelphia, Pa., May 2, 1957 and sponsored by American Materials Handling Society, 545 5th Ave., New York, N. Y.


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## Development of Engineering Managers

**By M. Anshen**
**Professor of Industrial Admin.**
**Carnegie Inst. of Tech.**
**Pittsburgh, Pa.**

Management is concerned with decision making. It contains elements of art and science. It consists of three principal activities: 1) Deciding, in given organizational environments, what are the important decisions to make; 2) making decisions; and 3) seeing to it that decisions once made are translated into appropriate action.

Two types of current programs deserve study. Those sponsored by universities, with participants nominated and financed by their companies; and those sponsored by individual companies for their own management people. The Carnegie Program for executives was designed primarily for men who are being prepared for early advancement to senior management positions. It seeks to encourage the development of the following capacities:

- Ability to take a company-wide view of operation problems—to see the inter-relations of production, marketing, finance, engineering, research, and personnel functions.
- Understanding of the human problems of business organizations—capacity to work with and through people, to win their loyalty, and to direct and strengthen their cooperative effort.
- Skill in organizing and analyzing facts for decision making—the tools and procedures of quantitative control in business operations.
- Understanding of economic and political problems—the economy-wide environment in which business leaders make and execute their policies.

One further consideration is important in connection with the use of either type of program. Management development cannot be pursued effectively through formal educational activities alone. In fact, there is serious danger that planned educational programs—whether university or company-sponsored—may lead to substantial waste of money, time, and effort, and may even generate harmful side effects in relation to expectations and morale, if for-

mal educational activities are not projected within the comprehensive framework of a total management-development program. Such a comprehensive program begins with a forward estimate of management requirements, detailed by time periods, levels, and principal skill requisites. The second phase in building a comprehensive program is the analysis of current management resources at defined levels, including resources that will become available for use through time. Comparison of needs and resources leads to the third phase; spelling out development requirements.

A comprehensive program should aim at building an integrated development activity that makes effective, related use of all educational and training devices. Specifically, this means rotation of job assignments to build technical skills, breadth of experience, and adaptability; assignment of planned growth in management responsibilities, with observation of performance and coaching by superiors; and intermix of on-the-job experience with formal educational projects.

From a paper given at the 1957 Engineering Management Conference, American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

▼ ▼ ▼

## Atomic Instruments For Industry

**By S. F. Malaker**

**General Manager**
**Daystrom Nuclear Division**
**Daystrom, Inc.**
**Elizabeth, N. J.**

Items which are not currently considered to be instruments—namely, nuclear reactors, will be adapted as process control equipment in future applications.

Atomic automation or automation will be an integral part of major chemical and manufacturing processes.

The outlook for the atomic instrumentation is good and the growth of the market will be limited only by imagination of engineers.

The type of instrumentation will change markedly in the next few years because of the introduction of new solid state devices and electronic applications.

Atomic instruments of the future will be considerably more sensitive to make use of the weak radiations of such isotopes as tritium and other soft beta emitters.

Future instruments will be lower in cost because of advanced technical knowledge and higher production due


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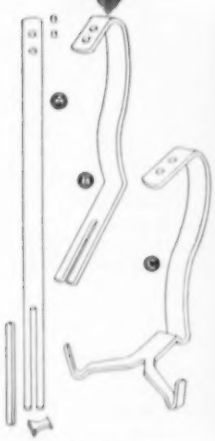
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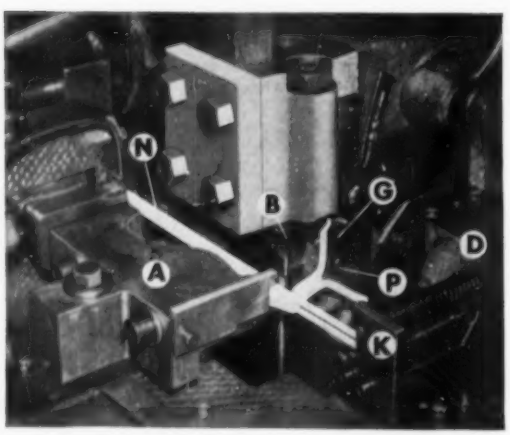
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Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogue . . . the first step to increased production.




Stand is zinc-plated steel strip 0.05 in. thick by 0.625 in. wide . . . made in steps A, B and C.




Final step in forming Kaz stands on Nilson 4-slide. Feet are spread, bent, crimped (G) with workpiece (P) on centerpost while next piece (N) is being cut off. Stop (K) on right slide (D) backs off after cut and workpiece (P) is wrapped around centerpost by die (A) when finished part is clear.

THE A. H. NILSON MACHINE CO.
1520 Bridgeport Ave., Shelton, Conn.

NILSON

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to standardization.

The full scale training program must be carried out to make known to engineers in industry the possibilities in utilization of radiation techniques.

The major area requiring improvements is that of detectors or sensors.

Present components will not withstand high temperatures and radiation damage. It is possible that new solid state devices will be developed which will measure temperatures by changes in magnetic structure; for example, Curie Point Transitions may be used as on off switches. Since these points are functions of temperature in various alloys, they might make excellent sensors.

Low power reactors currently used for research or training will be modified for production-line testing and chemical activation.

Low level beta isotopes will become more widely used to decrease health hazards and, therefore, will require more sensitive equipment.

As radiation techniques become more widely spread in industry, a broad scale training program will become incumbent on industry.

Future equipment will tend to be devoid of electron tubes. The amplifiers will be of the magnetic amplifier type, and the detectors will be solid state in nature.

From a talk given at the 1957 Conference on Atomic Energy in Industry of the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y.

▼ ▼ ▼

## How To Weld Tool Steels

**By Patrick S. Doyen**
**Welding Equipment and Supply Co.**
**Detroit, Mich.**

In inert gas welding of tool steels, the best weld usually is that which has the same chemical, metallurgical and physical properties of the base metal itself.

This matching of properties, allows the welded unit to respond to heat treatment which is often required to facilitate machining.

Fundamental rules are: determine the type of tool steel to be welded; select an electrode or rod to match the analysis of parent material as close as possible; preheat tool steel units before welding; peen the weld deposit to offset shrinkage when using metallic arc welding; preheat or temper when possible.

From a paper given before the 10th Western Metal Congress, sponsored by the American Welding Society, 33 W. 39th St., New York 18, N. Y.

## Metals For the Atomic Age

**By Bernard Kopelman**

Chief Engineer
Atomic Energy Div.
Sylvania Electric Products, Inc.
New York 19, N. Y.

Increased efficiency of obtaining power from a heat engine of any type, whether fossil or nuclear, is dependent upon the attainment of higher and higher temperatures in the engine. Because of this, there is a large and concerted effort directed towards the development of metals and ceramics capable of withstanding high temperatures under the various conditions of corrosion, radiation and stress. The so-called wonder metals like titanium or even zirconium are not useful at all in this high temperature area, between 2000 and 4000 F.

Thus a whole new field of refractory metals and ceramics is developing which in the decade to come will be as important or even more important than the successful commercial development of titanium and zirconium. The metals expected to take a prominent position in this area are principally molybdenum and niobium. Their strength to weight ratio is exceptionally high and makes them more favored than metals such as tungsten, although this is undergoing re-examination for high temperature applications. Even rhenium and several rather rare earth metals, considered laboratory curiosities only a few years ago are currently enjoying widespread examination and development.

The metals which will be successful in this attempt to break through present temperature limitations must have a high strength to weight ratio, must have good oxidation resistance to air at temperatures over 2000 F, must be capable of standing moderate stress and in the nuclear picture must be stable against radiation.

Regarding ceramics, these too hold great promise for use at temperatures above 2500 and up to 4000 F. Here the problems are ductility, thermal shock resistance, heat conductivity, ability to carry stress, and for nuclear purposes, impermeability to the escape of fission products through the cladding. A breakthrough in ceramics may be further away than in metals, because of their brittle nature. Thus, either ductile ceramics are needed or designs aimed at avoiding the inherently poor mechanical properties of ceramics.

From a talk given at the 1957 Conference on Atomic Energy in Industry of the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y.

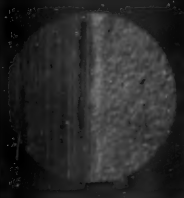
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Micro-photograph (right side) shows how Flo-Finish eliminates grinding marks.

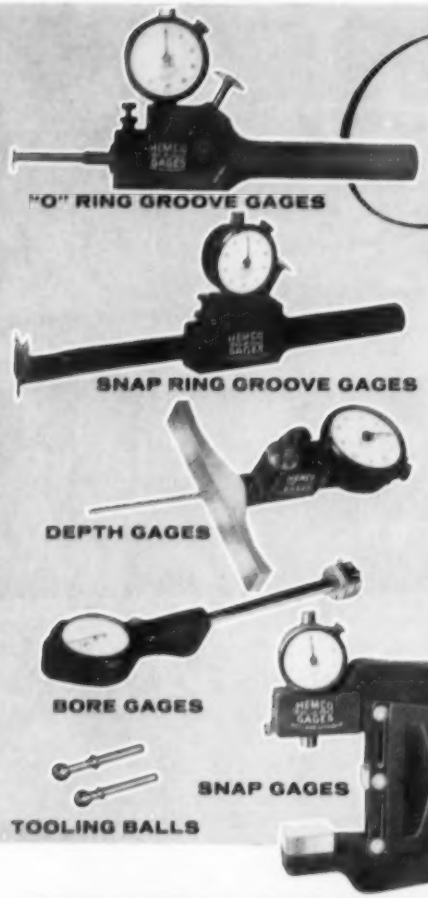
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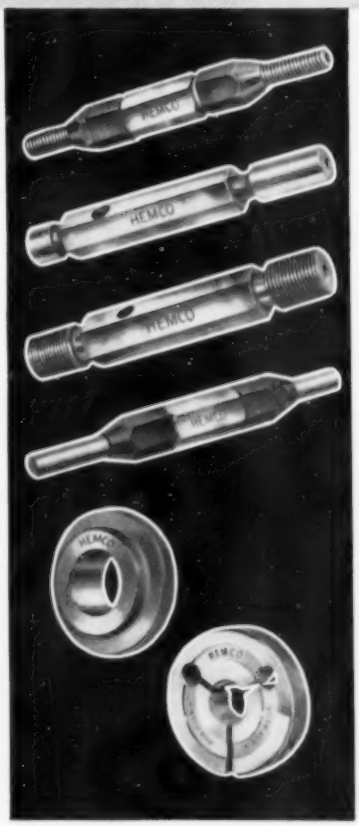
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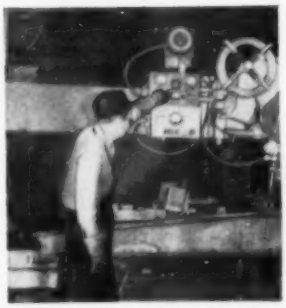
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LINDE's UNIONMELT Welding gives dense, sound welds in light-gage or heavy metals, at high speeds, automatically or manually.



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**The NEW 3/8" capacity**

6-spindle

automatic indexing

drilling and tapping



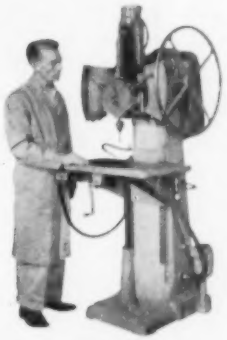
# Burgmaster® Turret Drill

sensitive, fast **Model 1C**

Larger models in capacities

**The Model 1C** turret drilling and tapping machine expands the Burgmaster line to include a smaller capacity, sensitive feed, fast operating machine. It is built to the same rugged standard for rigidity and accuracy evident in the larger units. The Burgmaster principle of bringing the spindle to the work eliminates the necessity of realigning for each operation. This reduces scrap and cuts time and in many instances eliminates fixtures. This unit frees heavy duty machines for larger capacity work.

## SPECIAL FEATURES



- automatic indexing
- 7″ spindle travel
- preselective spindle speeds
- precision depth control
- sensitive hand feed
- quick setup
- close tolerances maintained
- low maintenance cost
- surface ground work table

## SPECIFICATIONS

| | |
|---|---|
| Drill Capacity in mild steel | 3/8″ |
| Tap Capacity in mild steel | 5/16″ N.F. |
| Drill Motor | 1 HP, 2 Speed, 3 Phase, 60 Cycle |
| Turret—Spindle Travel | 7″ |
| Throat Depth | 9 1/8″ |
| Spindle Runout at Spindle Nose | .0003 TIR |
| Accuracy of depth control | .002″ |
| Max. Tool Clearance | 4 3/4″ Diam. |
| Size of the Table | 14″ x 24″ |
| Max. Clearance, Spindle Nose to Stand. Table | 24″ |
| Min. Clearance, Spindle Nose to Stand. Table | 8 1/4″ |
| Clearance Spindle to Base | 42″ |
| Max. Height | 75″ |
| Max. Width | 27″ |
| Max. Length | 38″ |
| Weight Uncrated | 1000 lbs. |
| Weight Crated | 1200 lbs. |

20 minute, sound film available on request from any of our offices. Shows all models and new positioning table in action.

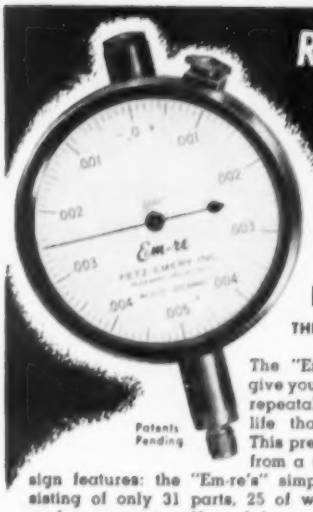
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The "Em-re" Dial Indicator will give you greater accuracy, greater repeatability and longer service-life than ever before possible. This precision performance results from a unique combination of design features: the "Em-re's" simple, unit construction consisting of only 31 parts, 25 of which are interchangeable and common to all models — a fully jeweled gearing mechanism — and a completely shockproof system, throughout the *entire* range, that *actually contributes* to the measuring accuracy obtained. Rigid testing with millions of severe impacts has failed to impair even slightly this repeated accuracy (to better than .00002" in .00005" and .0001" indicators). Stocked in 26 models, 8 ranges from .002" to 1.000"; graduations in .00005", .0001", .00025", .0005" and .001". *Also available for accurate indicator testing — The "Master" Dial Indicator Checker.*

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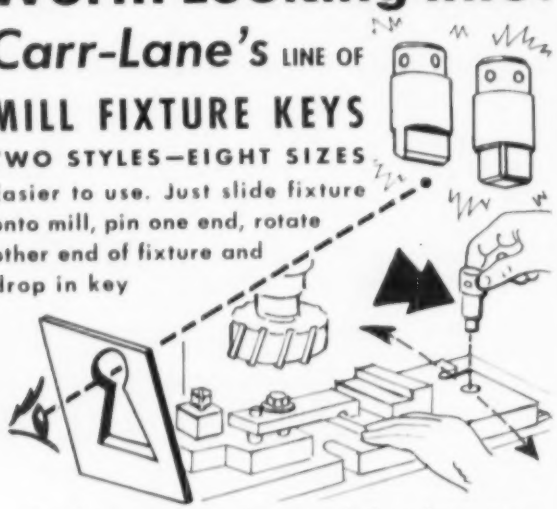
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Easier to use. Just slide fixture onto mill, pin one end, rotate other end of fixture and drop in key



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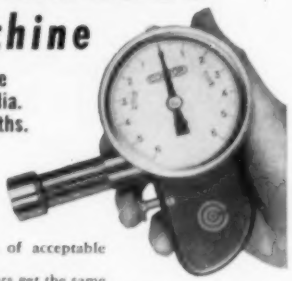



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**Precision Internal Gage for holes ⅛" to 10" dia. with tolerances in tenths.**



**USERS SAY:**

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"Back tapers eliminated."

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"Doesn't get out of order if handled a little rough."

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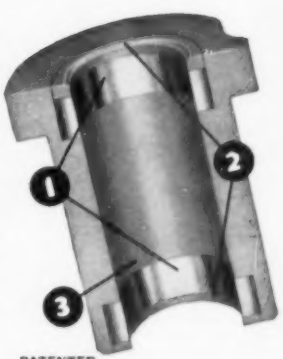
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The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures . . . accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

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PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

EST. 1888



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# BROWN & SHARPE standard design of the No. 11 Face Grinder provides all basic features needed for FULL AUTOMATION

## at Thompson Products

**NO. 11 FACE GRINDING MACHINE** is used in a fully automated production line, between centerless grinding and polishing operations.

**OPERATION** is grinding one face of cylindrical parts for automobile power steering assemblies.

**AUTOMATIC CYCLES** and work-handling equipment eliminate manual operations. Grinding, wheel-dressing, work loading and unloading are fully automatic. Machine stops automatically, when minimum usable diameter of grinding wheel is reached, for replacement of the wheel by the operator.

**SPECIAL TRANSFER ARM** has two chambers, swings down to unload finished part into one chamber, and load chuck with unground part from other. At top of travel, the arm ejects finished part into track to next operation, and loads unground part, for transfer to chuck. Chuck is flushed with filtered coolant after each unloading.

**AUTOMATIC PRESET GRINDING CYCLE** includes rapid advance, wheel feed, spark out, and rapid retraction.

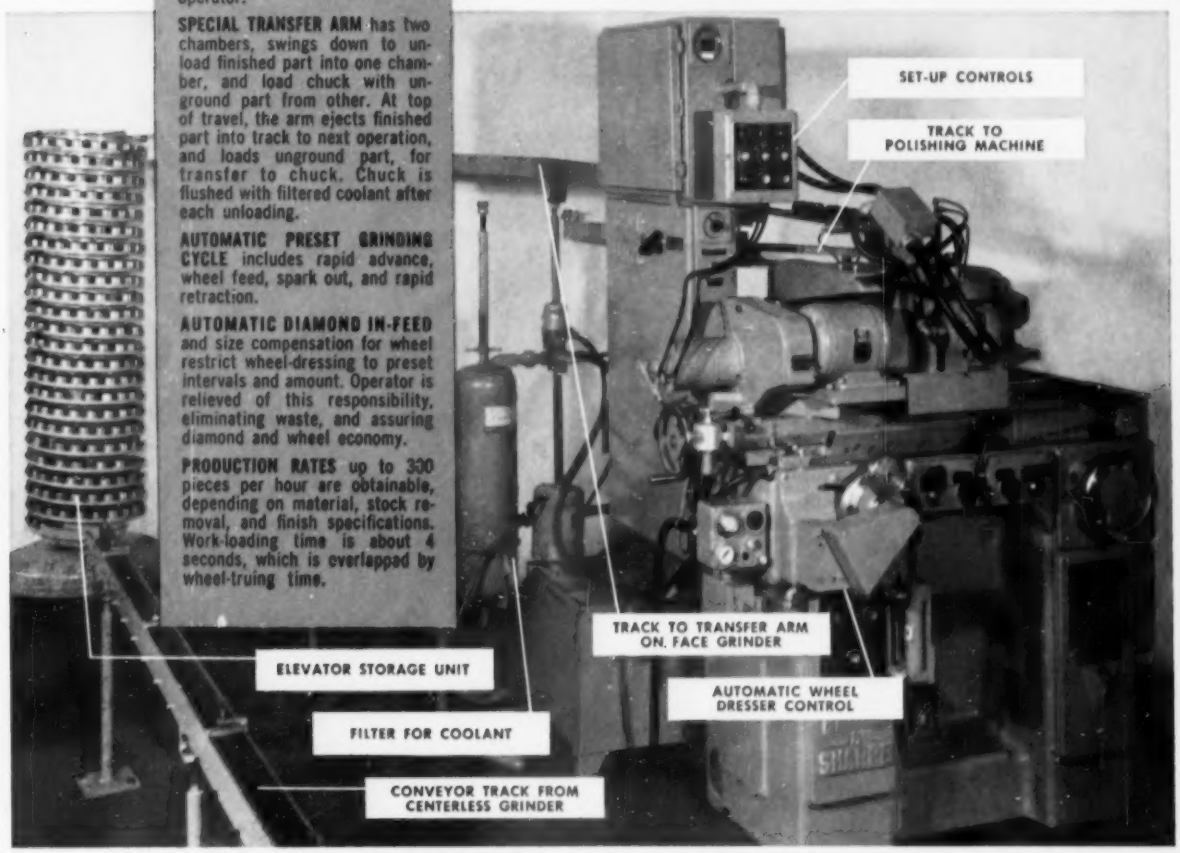
**AUTOMATIC DIAMOND IN-FEED** and size compensation for wheel restrict wheel-dressing to preset intervals and amount. Operator is relieved of this responsibility, eliminating waste, and assuring diamond and wheel economy.

**PRODUCTION RATES** up to 300 pieces per hour are obtainable, depending on material, stock removal, and finish specifications. Work-loading time is about 4 seconds, which is overlapped by wheel-truing time.

Rapid and costly obsolescence of special machines can be avoided when you start with a *standard* machine that permits designing for any degree of automatic operation.

At Thompson Products, the No. 11 Face Grinding Machine, completely automated with the addition of special automatic cycles and work-handling equipment, meets full production demands for power steering parts used by a leading automobile manufacturer.

If specifications should be changed, or if the part is eliminated, the machine can be reconverted for revised special requirements, or for standard operations, without major expense.




**The No. 11 Face Grinder without special equipment** is setting new production records on a wide range of face grinding jobs — employing only the standard features which permit a semi-automatic grinding cycle and preset wheel dressing control. Find out how it can lower your costs.

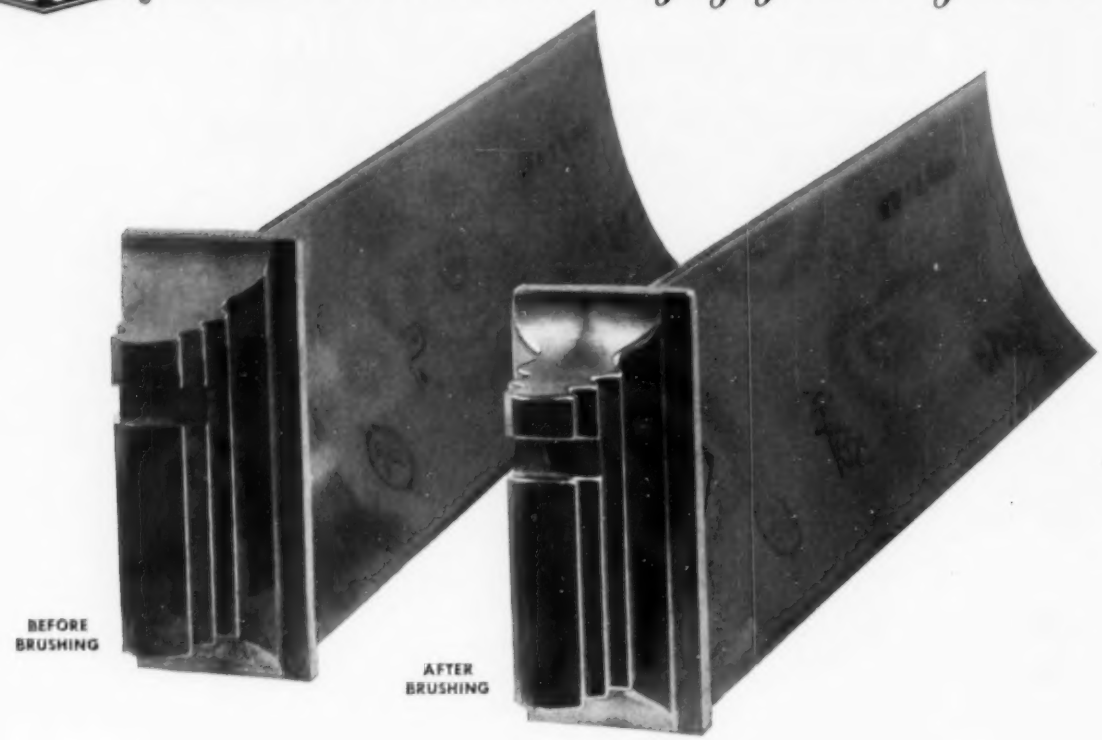
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OSBORN BRUSHING METHODS worthy of your confidence



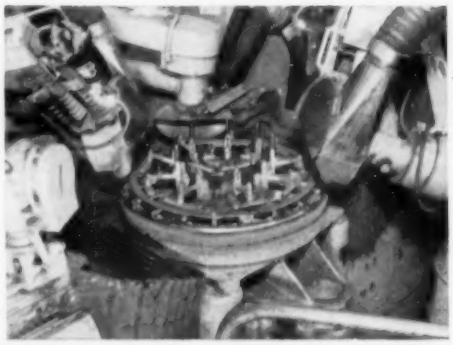

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## . . . solved with Osborn Power Brushing

YOU'RE looking at the root end of a turbine blade for jets . . . one of hundreds that go into every engine. Size and surface finish of the root must be held to exacting precision for perfect assembly and highest ultimate strength. Yet production costs must be down to earth.

Utilizing Osborn's power brushing method, jet blades are held in a fixture and traversed past Osborn Fascut® Brushes. In one simple operation, all minute burrs on the root end are removed, surface junctures are blended eliminating sharp corners where stress concentrations might occur. Results are uniform, dependable . . . at a high rate of production. The operator has only to load and remove parts.

An **O**sborn **B**rushing **A**nalysis will show you how Osborn Power Brushing can simplify your metal-finishing operations. Write *The Osborn Manufacturing Company, Dept. K-38, Cleveland 14, Ohio.*



*Osborn Brushamatic® 51-3L with three brushing heads finishing root ends of jet blades.*

Send TODAY for the new 20-page Brushamatic Booklet

Osborn Brushes

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY






Bending of the tool body in expansion automatically provides clearance.

## With Each Expansion, You Get A New Cutting Edge

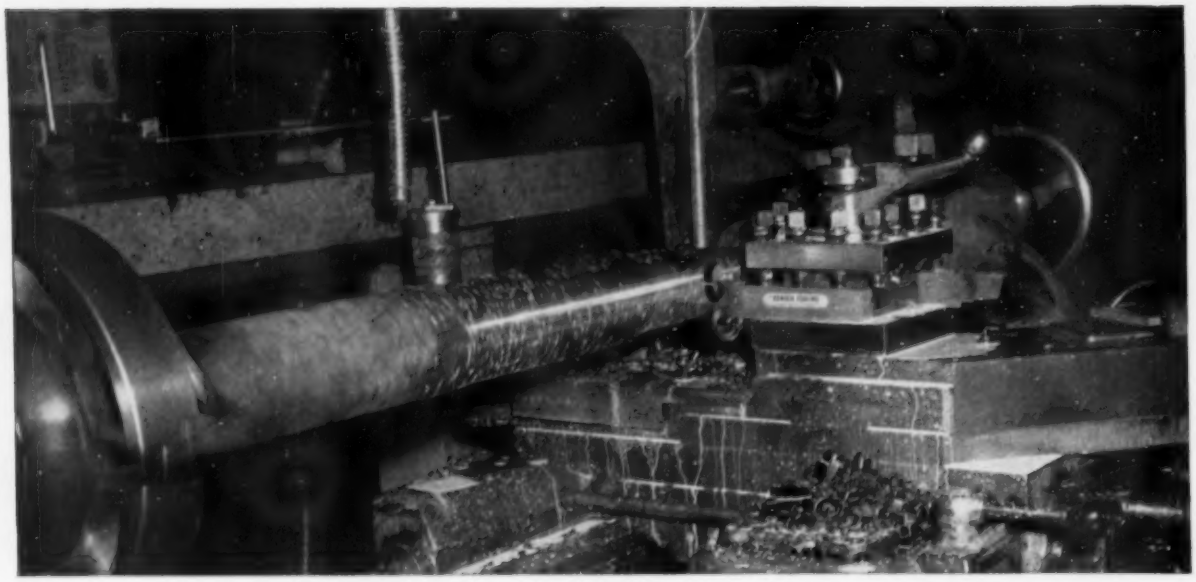


There's extra rigidity and accuracy in these Staples Expansion Reamers. Tool bodies are solid—not split. Expansion plugs, contacting well beyond the rear of the tips, apply uniform parallel pressure.

. . . Write for a catalog of Staples Precision Carbide Tools.

# Staples
## CARBIDE TOOLS

THE Staples TOOL COMPANY



# KENNAMETAL* Tooling *plus* Tool Engineering Service Tripled Return on Tooling Dollars

It doesn't show in the picture—but the Kendex tooling illustrated is producing THREE TIMES more parts per tool dollar than the clamped tools previously used. For Proof—see Case I below.

In many cases, results like these can't be obtained by "off the shelf" tools and "off the cuff" methods. Today's many new alloys and multitude of operations call for (1) scientific job analysis, to determine proper setups, speeds, feeds, and cuts, (2) scientific tool selection which may call for special tools for complex operations, and (3) machinist cooperation, to assure correct procedure. Kennametal's experienced Tool Engineers will work with your tool engineers and operating men in getting the right tool on each job. If standard Kennametal tooling does not cover the job . . . your Kennametal representative can make proper recommendations as all Kennametal field men are specially-trained tool engineers. For more information . . . just write to KENNAMETAL INC., Latrobe, Penna., Department KE.

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**CASE I**

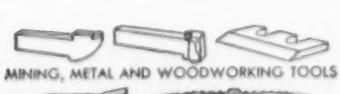
Job illustrated above is profiling motor shafts of SAE 1045 and 4150; Brinell 200-300; length, 24" to 96". When clamped tools with various carbides were used, costs averaged $311 per month for 18 months' continuous production. Kendex tools with Kennametal Grade K21 throw-away inserts, in the first half-year period, cut the cost to $102.70 per month. (For detailed data, ask for Performance Report No. 540.)

**CASE II**

In a production run turning countershaft pinions, SAE 4140; Brinell 212; length 4½"; Kendex tooling with the same K21 grade of insert cut tool cost to one-seventh that of previously-used insert tools. (Details—Performance Report No. 533.)

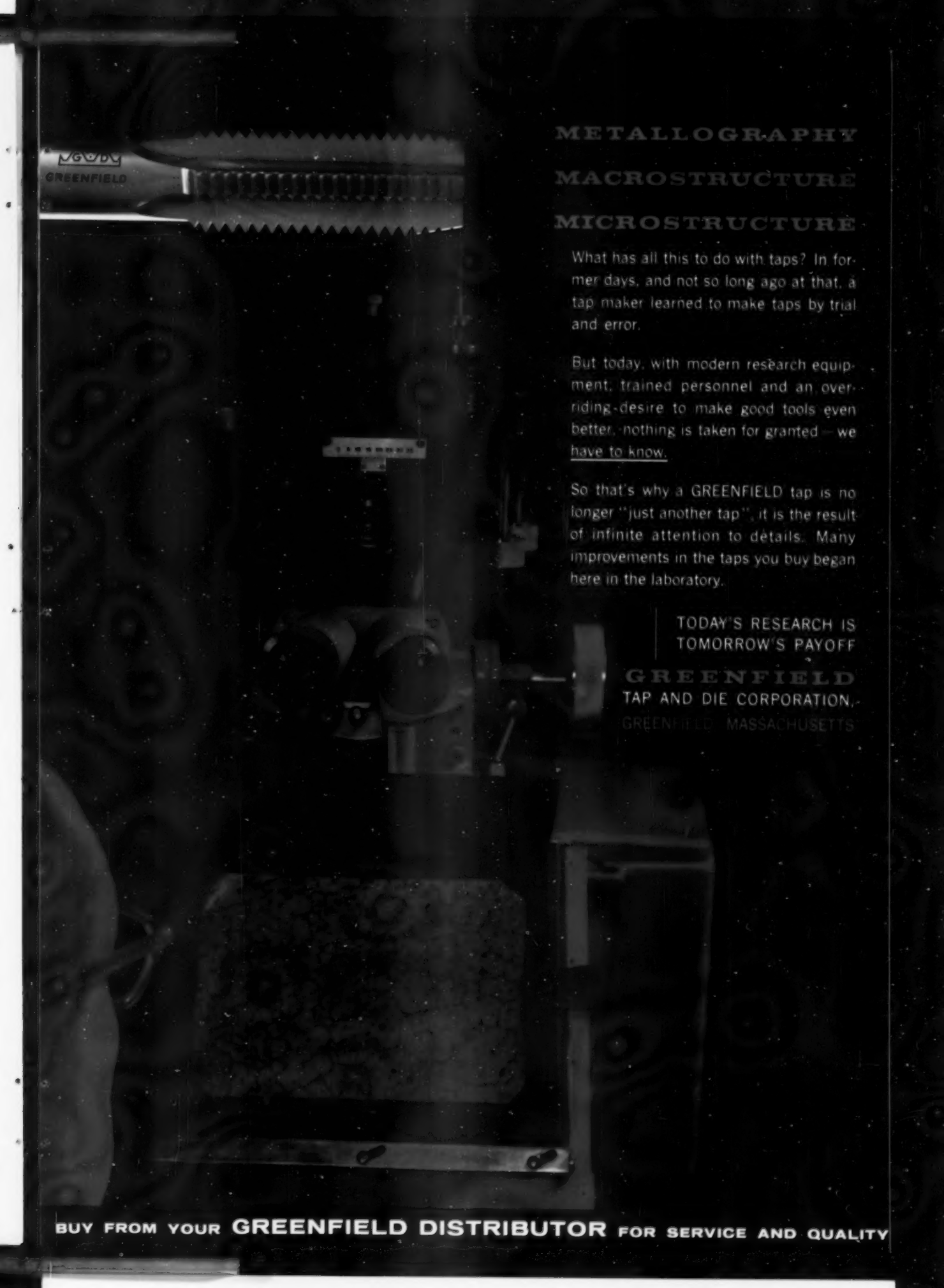
**CASE III**

In turning alloy steel rotor shafts, 34 to 36 Rockwell C, tool cost per piece was reduced from $.041 to $.022 when brazed tools were replaced with Kendex Roller Turner and Grade K21 inserts. Added savings came from higher speeds and less downtime. (Performance Report No. 537.)




INDUSTRY AND KENNAMETAL ...Partners in Progress






# METALLOGRAPHY

# MACROSTRUCTURE

# MICROSTRUCTURE

What has all this to do with taps? In former days, and not so long ago at that, a tap maker learned to make taps by trial and error.

But today, with modern research equipment, trained personnel and an overriding desire to make good tools even better, nothing is taken for granted — we have to know.

So that's why a GREENFIELD tap is no longer "just another tap", it is the result of infinite attention to details. Many improvements in the taps you buy began here in the laboratory.

TODAY'S RESEARCH IS
TOMORROW'S PAYOFF

**GREENFIELD**
TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

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Photo courtesy of The Lodge & Shipley Company

**THE LATHE** — *Lodge & Shipley 16" Power-Turn 90° Copymatic Lathe*

**THE OPERATION** — *Turning and facing to close tolerances*

**THE CHUCK** — *Horton, of course*

**HORTON CHUCK DIVISION**
Greenfield Tap and Die Corporation
Windsor Locks, Connecticut

HORTON
Since 1851
CHUCK

*Call Your Horton Distributor Now!*

BUY FROM YOUR GREENFIELD DISTRIBUTOR FOR SERVICE AND QUALITY




# ADAMAS "GRADE A"

## PERFORMANCE WINNER

For its role as the "standard of the industry" Adamas Grade **A** ranks as performance winner among all competing 6% cobalt straight tungsten carbide grades, (industry classification C-2).

Grade **A**'s outstanding performance in cutting tools, dies, and wear parts has won the applause of carbide users throughout the United States and Canada. Here is a dramatic sample of Adamas Grade **A** throwaway inserts in action on a typical turning operation of Navy "type D" cast iron . . .

**192 pieces per corner with a .250 depth of cut, 170 S.F.P.M. and .018 feed.**

Even in the carbide industry, stars are made not born. Grade **A**'s success is the result of Adamas' unique manufacturing processes which give Grade **A** its superior combination of three key metallurgical properties: . . . hardness . . . density . . . and transverse rupture strength.

Benefit from Grade **A**'s metallurgical superiority . . . write today for your free copy of: "Grade **A** . . . Metallurgical Facts and Application Tips".

Address Dept. 253

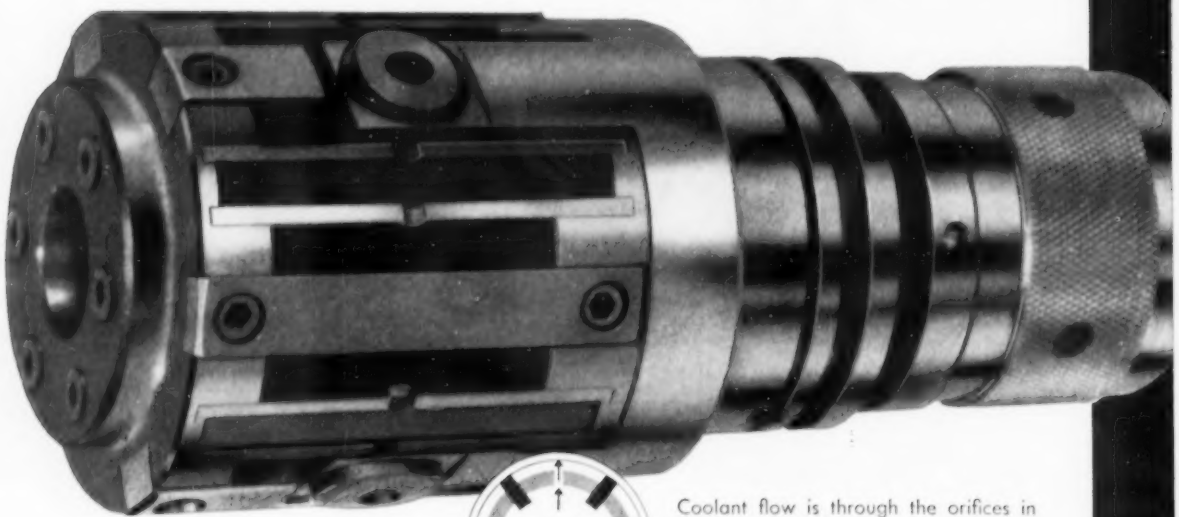
**Contact Adamas for the name of your local distributor.**

**ADAMAS CARBIDE CORPORATION, KENILWORTH, N. J.**

PRODUCERS OF TUNGSTEN CARBIDE TOOLS, TOOL TIPS, DIES, WEAR PARTS, DEX-A-TOOL and CERALOX.

# new liquid sizing

**automatically gauges full length of honed bores**






Coolant flow is through the orifices in the honing tool. By incorporating liquid sizing on the tooling, brackets used with other types of sizing have been eliminated.

Barnesdril honing engineers have developed an improved method for sizing honed bores, as a part of the honing machine cycle. Referred to as Liquid Sizing, this method automatically gauges the diameter of honed bores throughout their full length as honing progresses.

Sizing is accomplished by metering liquid pressure, directed against the cylinder wall through orifices in the honing tool. As honing progresses, the bore increases in size, causing the pressure to decrease. When the pre-selected bore size is indicated over full length of honed bore by the balanced pressure, a limit switch terminates the honing machine cycle, permitting the tool to complete the stroke and withdraw from the bore.

This new Barnesdril Liquid Sizing method offers the following advantages:

1. Sizing the entire length of bore.
2. Better heat control as a result of directing the flow of coolant through the honing tool orifices to the most critical point.
3. Continual stone flushing, giving longer stone life and better micro finish control.
4. New Barnesdril Plate Type Honing Tools are utilized.

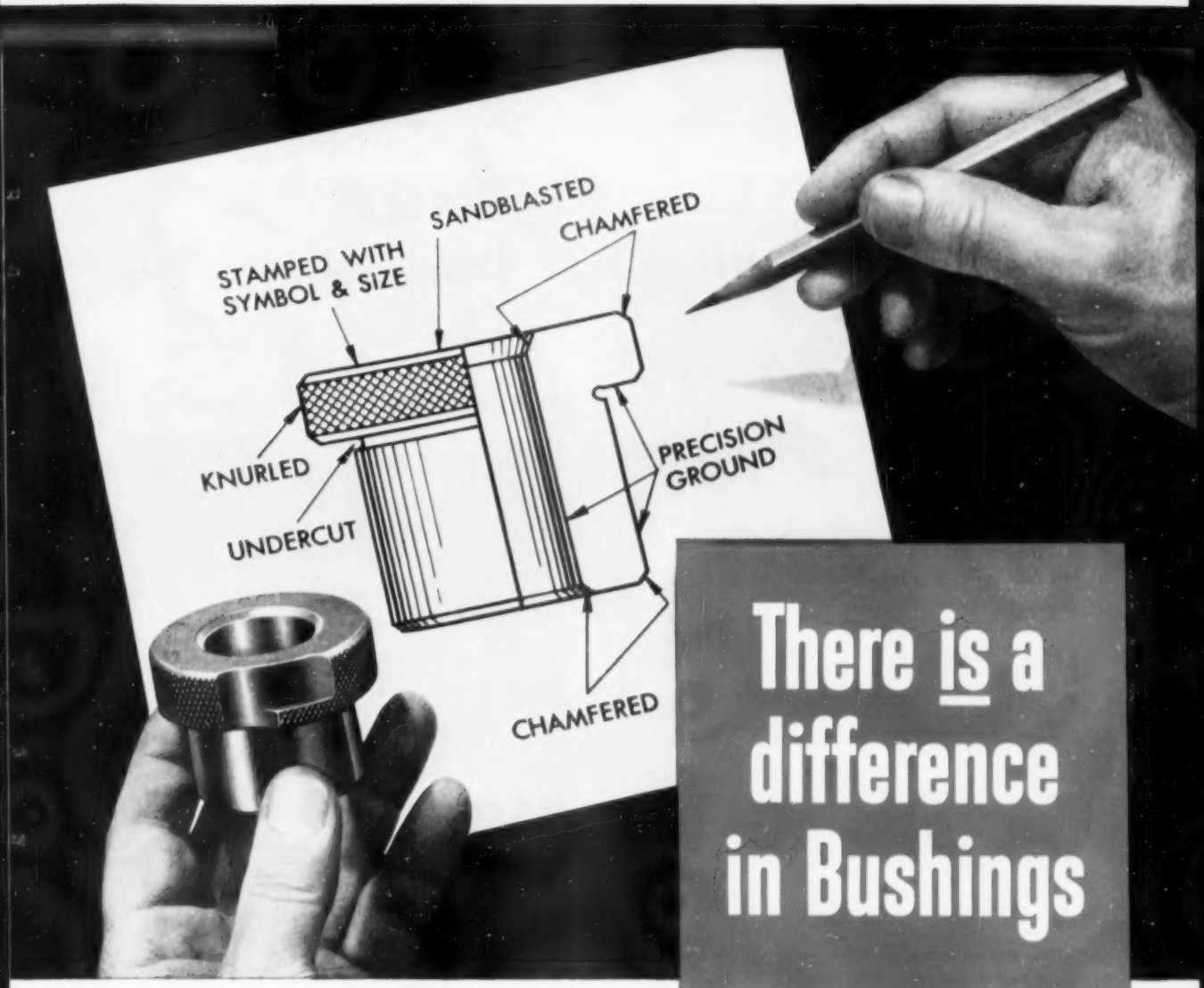
Contact your Barnesdril representative for full details on new Liquid Sizing, or write us directly. Years of engineering experience dealing with honing problems enable Barnesdril engineers to supply the most practical methods and equipment to solve your hole finishing problems.

**CUSTOM-HONING SERVICE**
for special short-run applications. Send us your short-run pieces, with specifications and requirements for prompt honing by expert technicians.

50th year

**BARNES DRILL CO.**

870 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road




# There is a difference in Bushings

## And here's what it means to you . . .



Recent tests in drilling 16,300 holes prove beyond doubt there's a difference in the wearing quality of bushings. Ex-Cell-O Bushings lasted twice as long as all other bushings in the test.

There's a difference, too, in accuracy and uniformity of hardness—brought about by automatic control of furnace temperature, time in the furnace, and quenching technique.

These differences make Ex-Cell-O the leader: (1) High chrome, high carbon oil-hardening bearing steel is used for long wear. (2) This steel is uniformly heat treated to 62-64 Rockwell "C". (3) Bushings are precision ground on inside and outside diameters, and under the head for perfect seating. (4) Besides measuring up to A. S. A. standards, bushings must meet Ex-Cell-O's own standards for precision.

Large inventories in Detroit, New York, Downey, Cal., Lima, Ohio, and London, Canada, keep your inventory down. You get immediate shipment.

Write for an Ex-Cell-O Drill Jig Bushing Catalog today.

**EX-CELL-O**
CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION

XLO

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-91

# HOLES JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.



A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

{ Borrow our instructive 11 minute movie on Jig Grinding. }

***Services of your Tool Room in Dayton***

ENGINEERING • PROCESSING • BUILDING • TOOLS DIES • SPECIAL MACHINES • VULCANAIRE JIG GRINDERS • MOTORIZED ROTARY TABLES • BREHM "SHIMMY" AND RELATED DIES • AUTOMATION

*Vulcan's 41st Year*

**VULCAN TOOL COMPANY**
**751 Lorain Ave., Dayton 10, Ohio**

VULCAN tools

USE READER SERVICE CARD; INDICATE A-9-240-1

# *Air-Cooled* Lighting by Dazor at Low Cost



Choice of Arm Extensions: 31" (No. 1100) 20" (No. 1101) Same Price

**Adjustable-Arm Models**



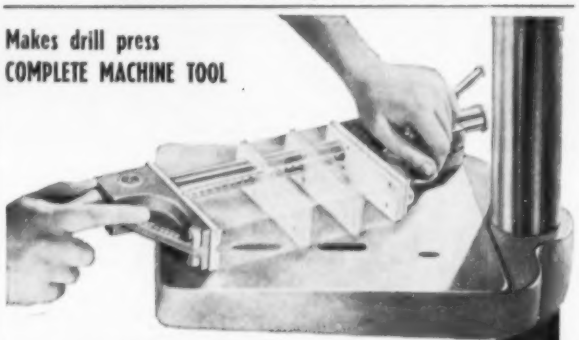
Light up machines and benches at rock-bottom cost and get Dazor dependability besides. New Adjustable-Arm Lamps mount solidly, hold fast in any position set. Either top- or side-mounted reflector. Air-cooled housing is safe to handle despite continuous use. Gray baked enamel over bonderizing. Call your Dazor distributor. Dazor Manufacturing Corp., St. Louis 10, Missouri.

...Makers of

**DAZOR FLOATING LAMPS**

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**Makes drill press COMPLETE MACHINE TOOL**



**AMF Float-Lock Instant-Change Vise**

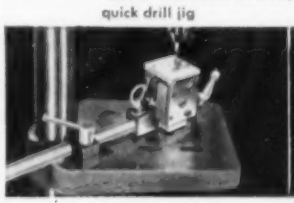
Positive anchoring . . . "Floats" and "Locks" in any position. Thumb-operated release ring permits instant change of jaw opening. Bosses on 2" centers provided on ratchet jaw for jig plates. Two models . . . 9" and 12" capacities. Special safety vise for band-saw also available.

Send for complete literature now.

Another AMF Product
Float-Lock SAFETY VISES

**AMF TOOL DIVISION**
**AMERICAN MACHINE & FOUNDRY COMPANY**
**224-A Glenwood Avenue, Bloomfield, New Jersey**

quick drill jig



centers long rounds



USE READER SERVICE CARD; INDICATE A-9-240-3

# "What's this about Stupalox Oxide Cutting Tools Increasing Production?"



*That's what we said!*

Rabbits aren't the only experts when it comes to increasing production.

Stupakoff research engineers have been working on this problem for over thirty years.

And now, at last, new high-strength oxide cutting tools have been perfected and tested which positively prove that in actual case histories *their use has increased production from two to ten times.*

*Sounds good?*

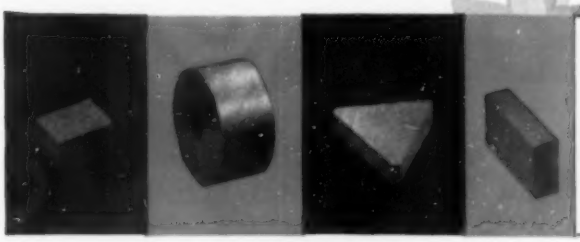
That's not all. Machining time and costs were cut as much as 50%. Careful examination of the work showed deeper cuts, smoother surface finishes and longer tool life. All this adds up to increased profits for you.

And there's something else which not even rabbits have thought of. When production is increased, fewer machines and less floor space are necessary. Consequently, capital investment can be greatly reduced.

*Want more facts?*

Stupalox has actual case histories available. For complete details, clip the coupon and mail it today.

*Send the coupon today*



STUPAKOFF Division of
The Carborundum Company, Latrobe, Pennsylvania

Please send me case histories and other data on Stupalox oxide cutting tools.

NAME_____ TITLE_____

COMPANY_____

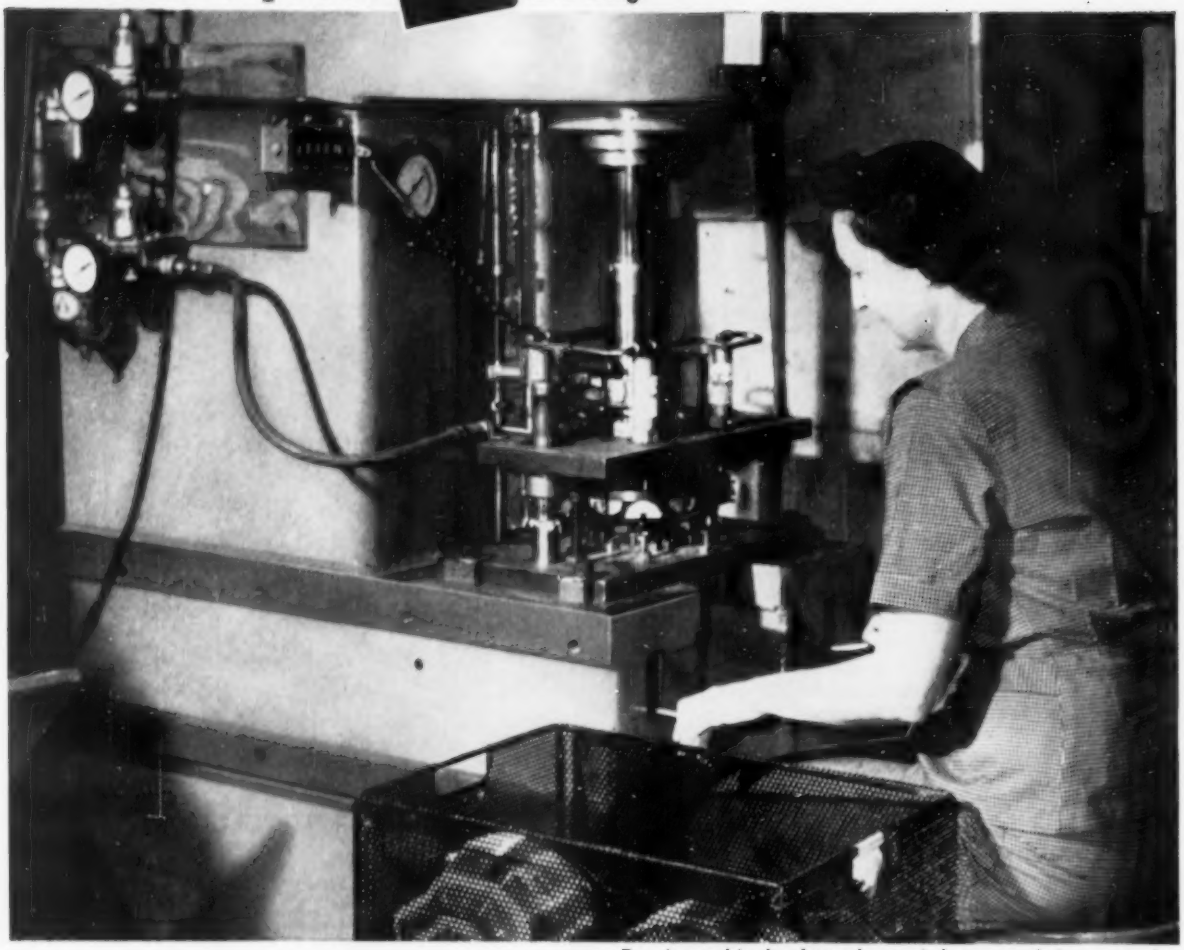
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**STUPAKOFF** DIVISION OF

**The CARBORUNDUM Company**

*WRITE DEPT. TE* **LATROBE, PENNSYLVANIA**

A Multipress case study



*Forming multi-colored tops for music box carousels is an operation performed 1000 times per hour on this 8-ton hydraulic Multipress.*

# MULTIPRESS forms
## 1000 parts hourly for toy maker



DENISON's hydraulic Multipress has greatly increased production . . . cut rejects . . . lowered costs for a Los Angeles toy manufacturer, Mattel, Inc.

In one operation, an 8-ton Multipress is used to form the top for a music box carousel. The lithographed and pierced metal blank is placed on an 8-piece die set which has two sets of conical shaped form blocks. Only one ram stroke is required to form the multi-colored tops at the rate of 1000 per hour.

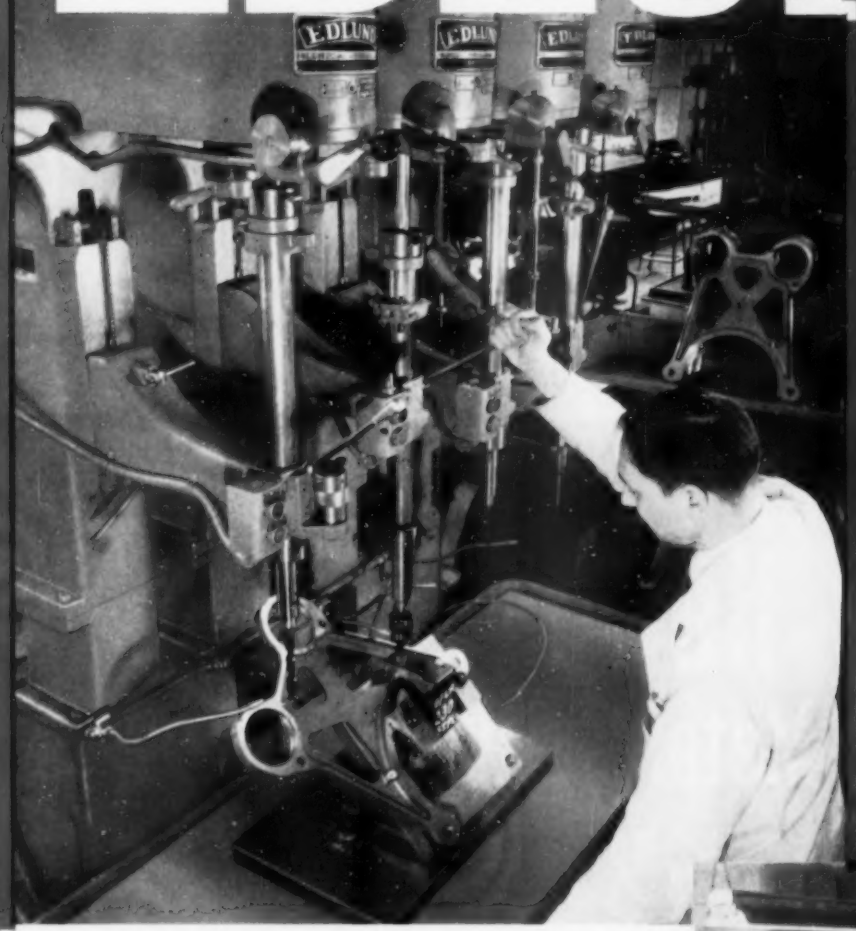
Datalog MUL-2 describes in detail Mattel's use of Multipress. For your copy, write Denison Engineering Division, American Brake Shoe Co., 1182 Dublin Road, Columbus 16, Ohio.

DENISON HydrOILics

**HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS**

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# EDLUND



Edlund 2F Drilling Machine in use at Pratt & Whitney Co. West Hartford, Conn., drilling, reaming and tapping precision parts.

## Edlund Model 2F Drilling Machines at PRATT & WHITNEY



Pratt & Whitney, famous manufacturer of machine tools — Jig Borers, Keller Machines, Gages and Cutting Tools, uses Edlund Drilling Machines to assist in the production of precision parts.

Modern features —
Flexibility of infinitely variable speeds • Rugged construction for sustained accuracy typical of Edlund; • No Loss of Production Time Changing Belts or Gears.

*For complete information and specifications about Edlund Model 2F Drilling Machines for your jobs, write for Bulletin 140R.*

Production Line of
Edlund 2F Drilling Machines
at Pratt & Whitney featuring—

- Power Table Lift
- Extra Spindle Travel
- Reversing Motor Tapper

Bulletin 1B —
Sensitive models for small parts and components
Infinite selection of speeds to 16,000 RPM
7" and 10" Overhang
½" Capacity
Pedestal and Bench Models
Write for Bulletin 160

EDLUND REPRESENTATIVES IN MAJOR CITIES

**EDLUND MACHINERY COMPANY**
Cortland, New York
Division of Harsco Corporation

Bulletin Model 2F —
A fast production machine for medium to heavy drilling & tapping
Infinitely variable speeds to 3600 RPM
8" — 12" — 15" Overhang
1¼" Capacity
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*Great in its day...*

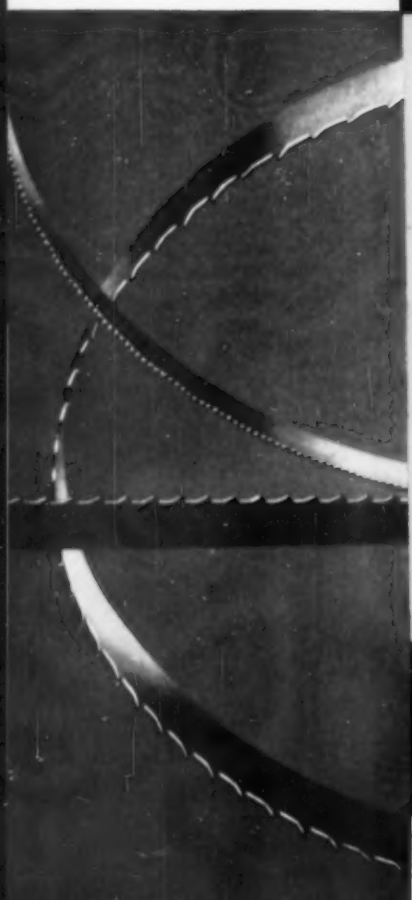


BUT WOULDN'T YOU
RATHER HAVE
THE LATEST
TECHNICAL ADVANCE?



*Now! An important new improvement in metal cutting*

# Heller "Job Tempered" Metal Cutting Band Saws



***Certified by American Standards Testing Bureau* to meet their standards for Superior Cutting — Uniform Teeth... Uniform Set... Uniform Temper***

When band saw machines are equipped with the *right* blade from Heller's brand new line of metal cutting band saws they give exceptionally fast clean cuts — at minimum unit cost — on a wide variety of materials and for long service periods.

Users report these better results because *every* Heller blade is JOB TEMPERED. Steel of a special controlled-analysis specified by Heller metallurgists, is heat treated by a unique process *matched to the steel.* This insures uniform temper and cutting qualities that mean unsurpassed performance on the job.

Teeth are made uniform in size, shape and spacing by machines of specialized design — the most modern in the industry.

Uniform set is made absolutely *certain* by a highly sensitive indicator developed for just this purpose.

Because of these improvements in the art of band saw manufacture, American Standards Testing Bureau gives its assurance that Heller's great new line of saws meet their standards for superior cutting:
uniform teeth — uniform set — uniform temper.

Why not put these exceptional blades to work earning for you?

* AMERICAN STANDARDS TESTING BUREAU INC. STB

HELLER TOOL CO. SINCE 1836

**Heller**

HELLER TOOL CO., *America's Oldest File Manufacturer*
Newcomerstown, Ohio — A Subsidiary of Simonds Saw and Steel Co.

## YOU GET THESE HELPFUL EXTRAS WHEN YOU USE HELLER BLADES

SOLD EXCLUSIVELY THROUGH

Heller DISTRIBUTORS

'YOUR OUTSIDE TOOL ROOM'

SERVICE + STOCKS = SAVINGS

**1. COMPLETE SELECTION** Heller offers a full selection of "Job Tempered" Metal Cutting Band Saws. You can choose exactly the right tooth shape, set, and blade width in standard or high speed steel as required for your application.

**2. CHARTS AND BOOKLETS FOR USERS** Your Heller Distributor will furnish you with wall charts and booklets to help you choose the *right* Metal Cutting Band Saw for your applications. These visual aids will show you the speeds and feeds required for best cutting results, for contour cutting or cutoff work.

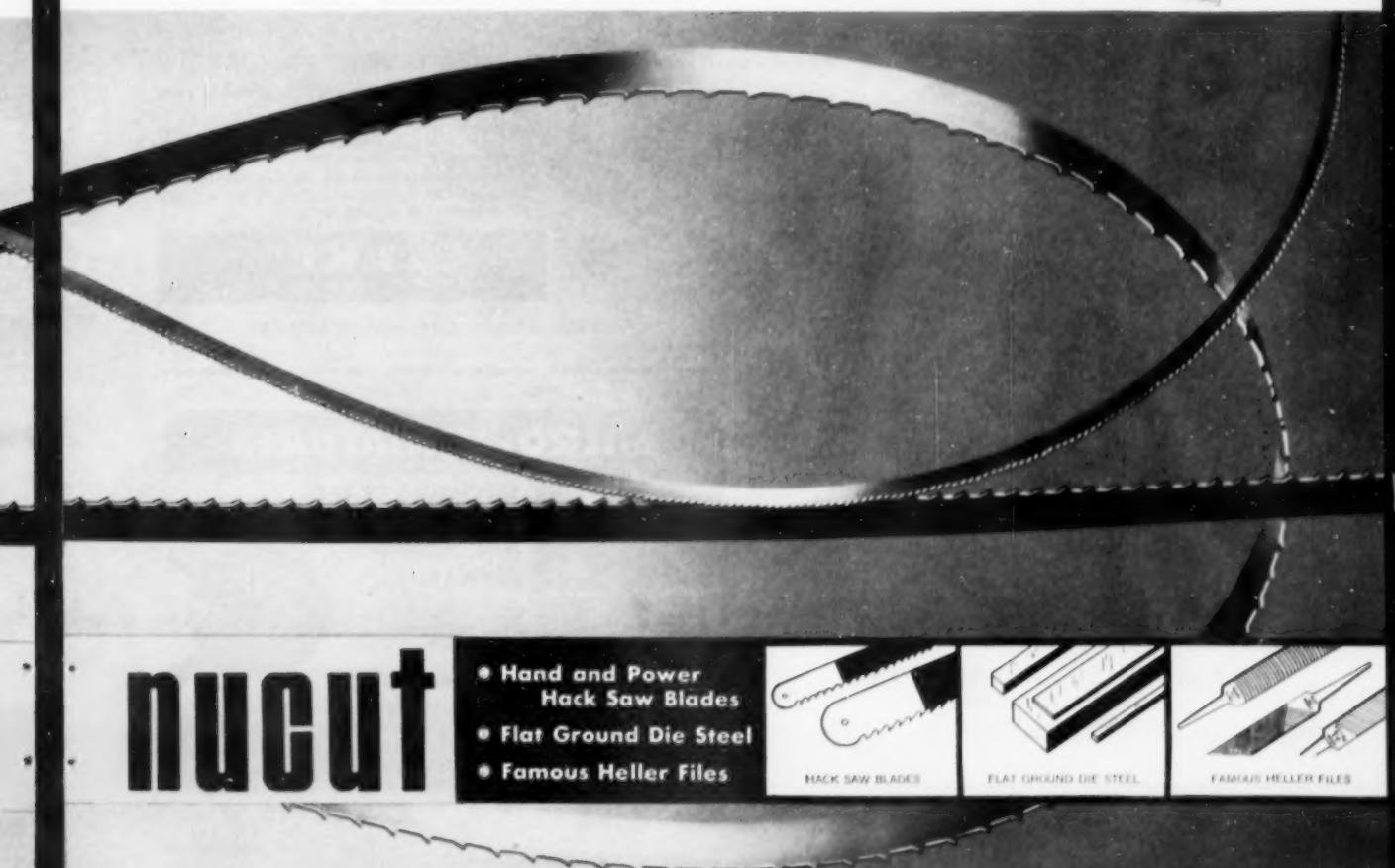


**3. CONVENIENT PACKAGING** Heller's packaging is designed for maximum user convenience. Blades come in bulk lengths of 100′ and 250′ coils so you can cut and weld the length you need when you need it. Or individually packaged blades are furnished cut and welded to fit all standard machines.

**HERE ARE THE FACTS!** Heller's new catalog of "Job Tempered" Metal Cutting Band Saws contains descriptions of all types of blades, tooth shapes, set, applications.

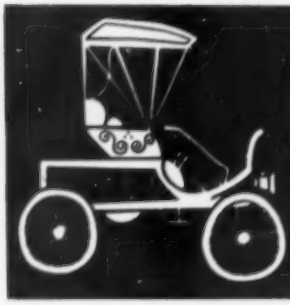
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# nucut

- Hand and Power Hack Saw Blades
- Flat Ground Die Steel
- Famous Heller Files



HOW **ANTIQUE** ARE YOUR MICRO-MACHINING METHODS?

**SMALL DRILLS MUST BE HELD IN PRECISION COLLETS TO ASSURE ACCURACY**

***LEVIN*** ® **MICRO-DRILL PRESS**

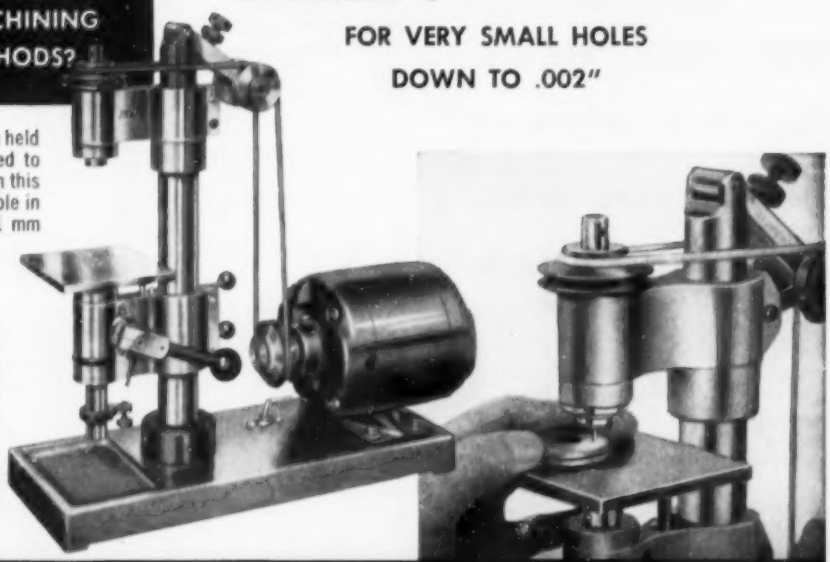
**FOR VERY SMALL HOLES DOWN TO .002"**

In the LEVIN micro-drill press drills are held in precision collets. Runout is reduced to practically zero and drill breakage from this cause is eliminated. Collets are available in a complete range of sizes down to .1 mm (.004").

**SPECIFICATIONS:**

Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

**Send for catalog M describing complete line of micro-drilling equipment, collets, instrument lathes and precision tools.**



**LOUIS LEVIN & SON, INC.—3610 S. BROADWAY—LOS ANGELES 7, CALIFORNIA**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-246-1

MAYLINE



**Mayline has the Outstanding Buy in Steel Base 4-Post Tables!**

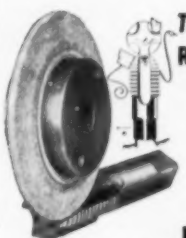
Notice in particular the following features of Mayline tables. *Base is of heavy gauge steel. *Wood feet have inset no-mar levelers. *All metal drawers run on ball bearing rollers. *Top is solid basswood with steel edges. *Available in 5 top sizes and 5 combinations.

*For complete information and prices, write the Mayline Company.*

**MAYLINE COMPANY, INC.**
611 No. Commerce St.
Sheboygan, Wisconsin

MAYLINE

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*Controlled Grinding of Tap Flutes and Chamfers*

***To Cut Your Tapping Costs,* GRIND and RE-GRIND YOUR TAPS ACCURATELY!**

Use these basic hook angles as a starting point for better tapping.

| | | | | | |
|---|---|---|---|---|---|
| Aluminum | 18° | Cast Iron | 5° | Brass | 5° |
| Copper | 18° | Magnesium | 18° | Plastics | 8° |
| Mild Steel | 8° | Stainless Steel | 12° | | |

Write for specific details on how the BLAKE Flute and Chamfer Grinders give you the accuracy you need for low tapping costs.

EDWARD **BLAKE** COMPANY INC.
950 CHERRY ST., WEST NEWTON 65, MASS.

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**MICRO-MINIATURES**



**SPECIALISTS IN THE MANUFACTURE OF SMALL END MILLS GROUND FROM SOLID**

*When you think of small END MILLS — think of MICRO MINIATURES*

DISTRIBUTORS IN PRINCIPAL CITIES

**WOODSON TOOL CO.**
4811 LENNOX BLVD. INGLEWOOD, CALIF.

*Write for Catalog*

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*Talk of the toolrooms!*

*New* **SIMONDS**

**SA *Borolon*®**

TRADE MARK

**GRINDING WHEELS**



## Faster, cooler grinding with heavier cuts

Exceptional for tool and cutter sharpening and horizontal surface grinding! Performance convincingly proved on tool-room grinders throughout industry. Unique single crystal formation of the abrasive cutting particles provides more stress-free cutting edges and permits cooler grinding, deeper penetration and better finish. Use SA Borolon wheels on *your* grinders. Get bulletin ESA 272 for details.




SIMONDS ABRASIVE CO.

**SIMONDS ABRASIVE COMPANY**

Tacony & Frankford Sts., Philadelphia 37, Pa.

DIVISION OF SIMONDS SAW AND STEEL CO.

BRANCHES: PHILADELPHIA · CHICAGO · DETROIT · LOS ANGELES · SAN FRANCISCO · PORTLAND, ORE.

CALL
YOUR SIMONDS DISTRIBUTOR

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Dependable know-how
Quick supply



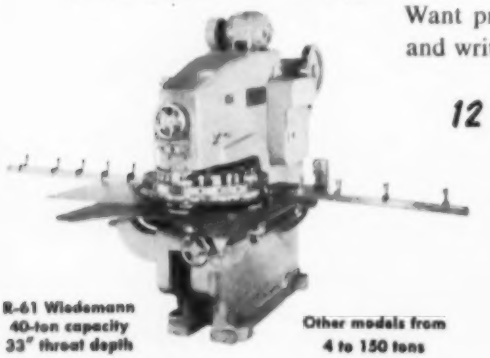
# CHANGE ANY TOOL in 5 SECONDS or Less!

. . . and that means money in your pocket when you're piercing short runs of panels, chassis, truck parts, etc.

All tools are in the turrets ready for use. By simply rotating the turrets, a tool of any shape or size from 7″ dia. down to .093″ is brought into piercing position in 5 seconds or less. Turrets are locked to assure positive punch and die alignment. When desired, substitute tools can be installed in 2 minutes or less.

Rapid tool changing coupled with a quick-setting work positioning gauge eliminates setup and layout. Work is accurately pierced at high speed. As a result, short to medium run piercing costs are cut 60% to 90%.

Want proof? Send drawings of your work for time study and write for Bulletin 201.



R-61 Wiedemann 40-ton capacity 33″ throat depth

Other models from 4 to 150 tons

***12 to 32 Punches and Dies Ready for Use***

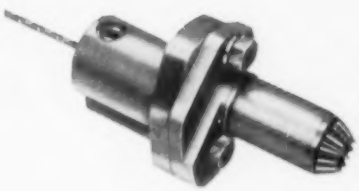
**WIEDEMANN MACHINE COMPANY**

**4245 Wissahickon Ave. • Philadelphia 32, Pa.**



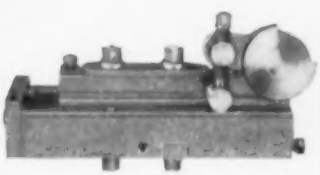
# Announcing

## New Additions to the RIGHT R and L LEFT Family! . . .



### NEW ON AND OFF CENTER DRILLING ATTACHMENTS

This ingenious turret drilling attachment is designed to save you second set-up time. It is no longer necessary to remove the cut-off piece in order to drill an off-center hole in the end of a bar. Merely stop the spindle, bring this tool into the work and continue the operation. The tool will operate within the capacity of the machine. (Available in 5/8", 3/4" and 1" diameter shanks.)



### NEW TOOL HOLDERS FOR MULTI-SPINDLE AUTOMATICS

This tool holder, made for circular tools, can be used on the front or rear cross-slide of multi-spindle automatics . . . It is made to operate within the capacity of the machine.



### NEW TOOL-SLIDE KNURLING TOOL FOR MULTI-SPINDLE AUTOMATICS

This tool can be used in the tool-slide of multi-spindle automatic screw machines or in the turret of turret lathes. The knurls may be adjusted for various diameters by turning them on an eccentric shaft . . . The tool will operate on any diameter within the capacity of the machine. (Another new R and L TOOL is the Cross-Slide Knurling Tool for Multi-Spindle Automatics.)

*Write for complete catalog of R and L TOOLS and literature and prices on these new tools.*



RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

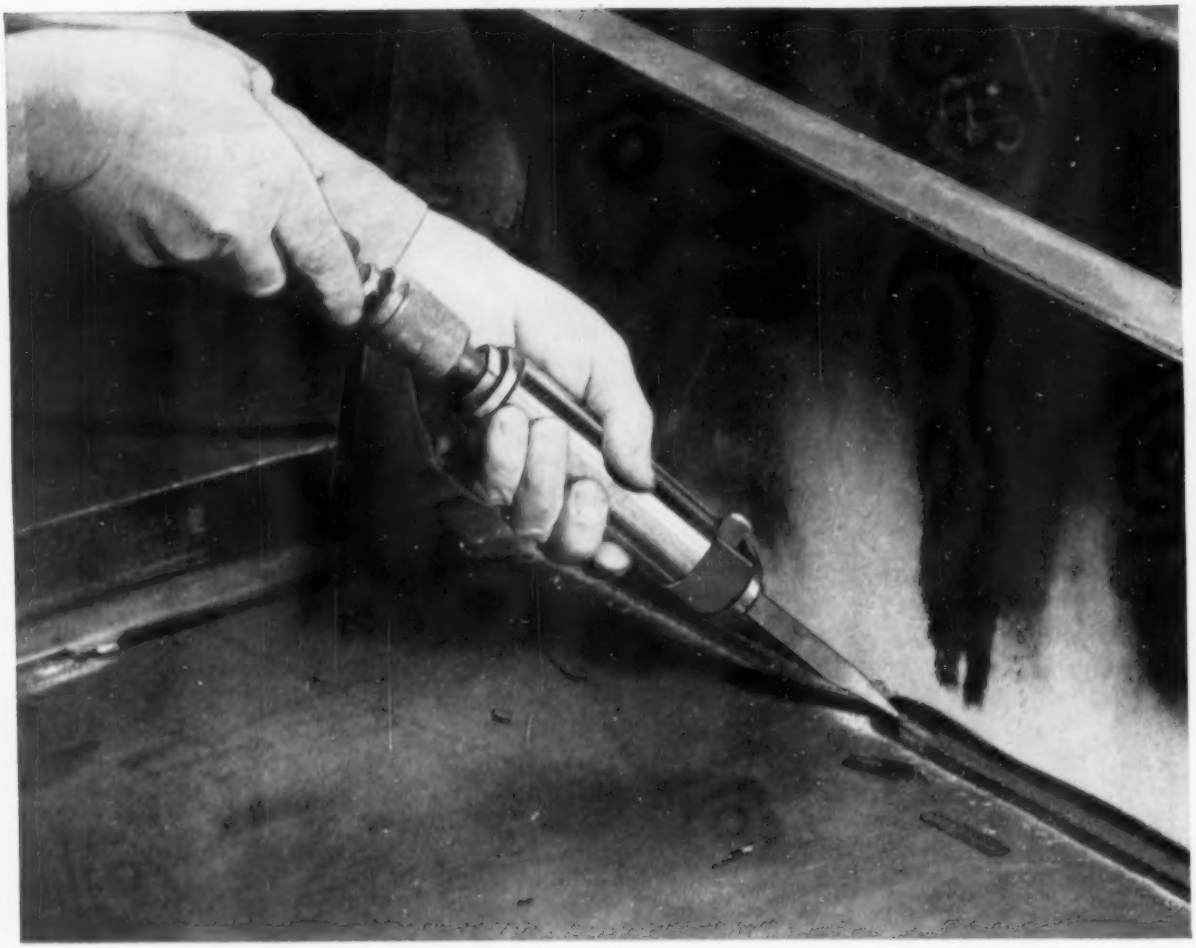
OTHER FAMOUS R and L TOOLS:
TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

R and L TOOLS
1825 BRISTOL ST.
PHILADELPHIA 40, PA.

☐ Please send me your new catalog
☐ Please arrange for no-obligation demonstration of R and L TOOLS

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COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

TE-9



# Cuts scaling time 60%

***JOB:*** Removing welding flash on fabricated parts. Formerly used heavier, slower welding hammer and pick. Switched to rugged, fast-hitting Rotor S-1P Scaling Hammer.

***RESULT:*** Reduced scaling time from 75 minutes to 30 minutes. Savings paid for new scaler in 60 working days.

Rotor S-1P is also ideal for peening, paint scaling, beveling of plates, light chipping and star drilling. Front exhaust keeps work clean. Push-throttle permits operator to rotate tool and chisel . . . start with a few blows and control blows up to 5000 a minute. Safety chisel retainer allows one-hand operation. Chisel bushing is replaceable. Available with three throttle handles: Push (S-1P), Lever (S-1L), Grip (S-1G).

Full details in Bulletin 54 . . . or ask for demonstration on *your* job. The ROTOR TOOL Company, Cleveland 32, Ohio.




**Rotor Air Tools:** Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
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ROTOR TOOLS®
CLEVELAND, OHIO

# only Vlier HEXNOSE spring plungers can be installed with an ordinary end wrench!



*Hexagonal nose eliminates need for spanner-type wrenches; speeds insertion, adjustment and removal!*

PATENT NO. 2,791,814

Whatever your spring plunger application—tooling or original equipment—you'll like the ease and speed with which Vlier Hexnose Spring Plungers can be installed.

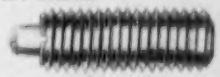
No more hunting for clumsy-to-use spanner-type wrenches or special screw drivers—any ordinary end, socket or crescent-type wrench will do the job quickly and easily.

Since the plunger nose is always easily accessible, the Hexnose really pays off where periodic adjustments must be made. Hardening both body and plunger assures body life. Available in both standard and light end pressure models; 11 sizes.

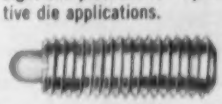
**THERE'S A VLIER SPRING PLUNGER FOR ALMOST EVERY CONTROLLED-END-PRESSURE APPLICATION!**



**Standard**
Primarily used in ordinary jigs and fixtures.



**Silvernose**
Light end pressure for repetitive die applications.



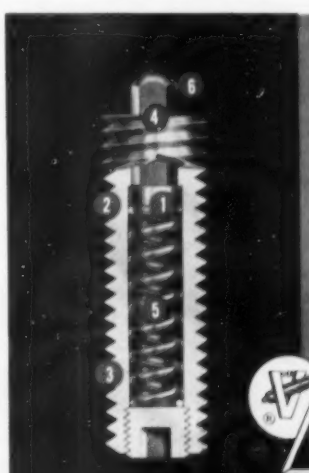
**Plastic Nose**
For use with aluminum, brass and other soft materials.



**Hexnose**
For greater ease in installing, adjusting and removing.

***Same sturdy construction as other Vlier spring plungers***

1. Large bearing surface overcomes binding, assures perfect alignment of the plunger at any extension.
2. Concentricity between plunger axis and body diameter held to .0015" T.I.P.R.
3. Rust-proof finish and National Coarse Class 2A threads prevent freezing in threaded hole.
4. Plunger end telescopes completely within body. Case-hardening assures extreme wear resistance. Ductile core overcomes brittleness and hazards of fracturing under impact, common with hardened, high carbon steels.
5. Spring pressures are accurate, uniform and dependable.
6. Accurately radiused nose speeds loading and unloading of jigs and fixtures.




**Send for your 1957 Vlier catalog.**

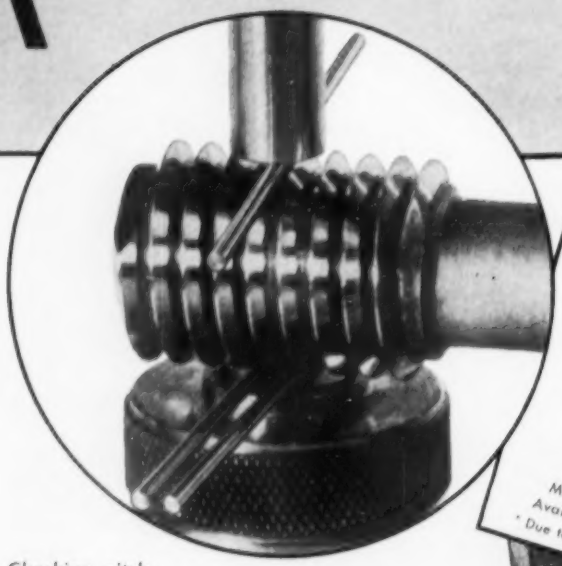



**VLIER ENGINEERING** INCORPORATED

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## ▼ Standard equipment everywhere



Checking pitch diameter of thread gage by three wire method on VK Light Wave Micrometer.

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When you order the NEW VK CALIBRATED THREAD MEASURING WIRES WITH MATCHED CONSTANTS

Max. Theor. Meas. P.D. Error* = .000015"

Available from stock at no increase in price.

* Due to effect of wire diameter



**Set No. 20 H.S. Thread Measuring Wires**

Every set of VK Standard Thread Measuring Wires, in addition to being within .000020" of best size, is now calibrated and furnished with matching constant. In many cases this will result in considerably more accurate pitch diameter measurements. These wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 H.S. pictured at the right will fill your needs. Similar sets to ± .000020" accuracy are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used.

Set No. 20 H.S. Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires....$135.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

38th YEAR

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# *How Eastman Kodak gets* Extreme accuracy...fine finish... years of trouble-free grinding

## *Norton wheel spindle a key factor in grinding performance that means...*

*steady savings!*



***Installed In March 1936*** at Eastman's Kodak Park Works in Rochester, N. Y., this Norton 10" x 96" Type C Cylindrical Grinder grinds alloy steel rolls to precision accuracy and very fine finish. Original wheel head spindle bearings have required no servicing in more than 18 years of 8 to 24 hours daily operation.

***The Norton Wheel Spindle Unit*** is an outstanding aid to the speed, accuracy and long service life of Norton cylindrical grinders. Note its over-all ruggedness and big heavy bronze bearings covering over half the spindle body.

*Why are Norton cylindrical grinders so fast and accurate over such a wide range of precision finishing and heavy stock removal jobs?*

*Why do these hard-working machines last so long, cost so little to maintain?*

Advanced features like the Norton wheel spindle unit are the answer. Advantages of this typical Norton development for better, lower cost grinding include:

- ***Over 50% of spindle body enclosed in two large heavy-duty, hard bronze bearings for extra long life.***
- ***Rugged proportions, and metals toughened by special heat treating, are further aids to long service.***
- ***Rigid support over practically the entire spindle surface affords maximum resistance to wheel pressures.***
- ***Bearing length of more than twice the diameter increases bearing life.***
- ***Automatic flood lubrication of bearings, with flow continually visible through bull's-eyes — an important safety and control feature.***
- ***End thrust taken on two large, hardened steel surfaces, also flood lubricated.***
- ***Modern precision boring for exact oil clearance keeps lubrication at top efficiency.***
- ***Wheel speed changes possible without readjusting bearings.***
- ***Extremely low unit pressure, due to long, continuous bearing surfaces, permits fast cutting and enduring accuracy.***

For further facts on how Norton cylindrical grinders can benefit your production, see your Norton Representative. Or write direct for Catalogs. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

***To Economize, Modernize with NEW***

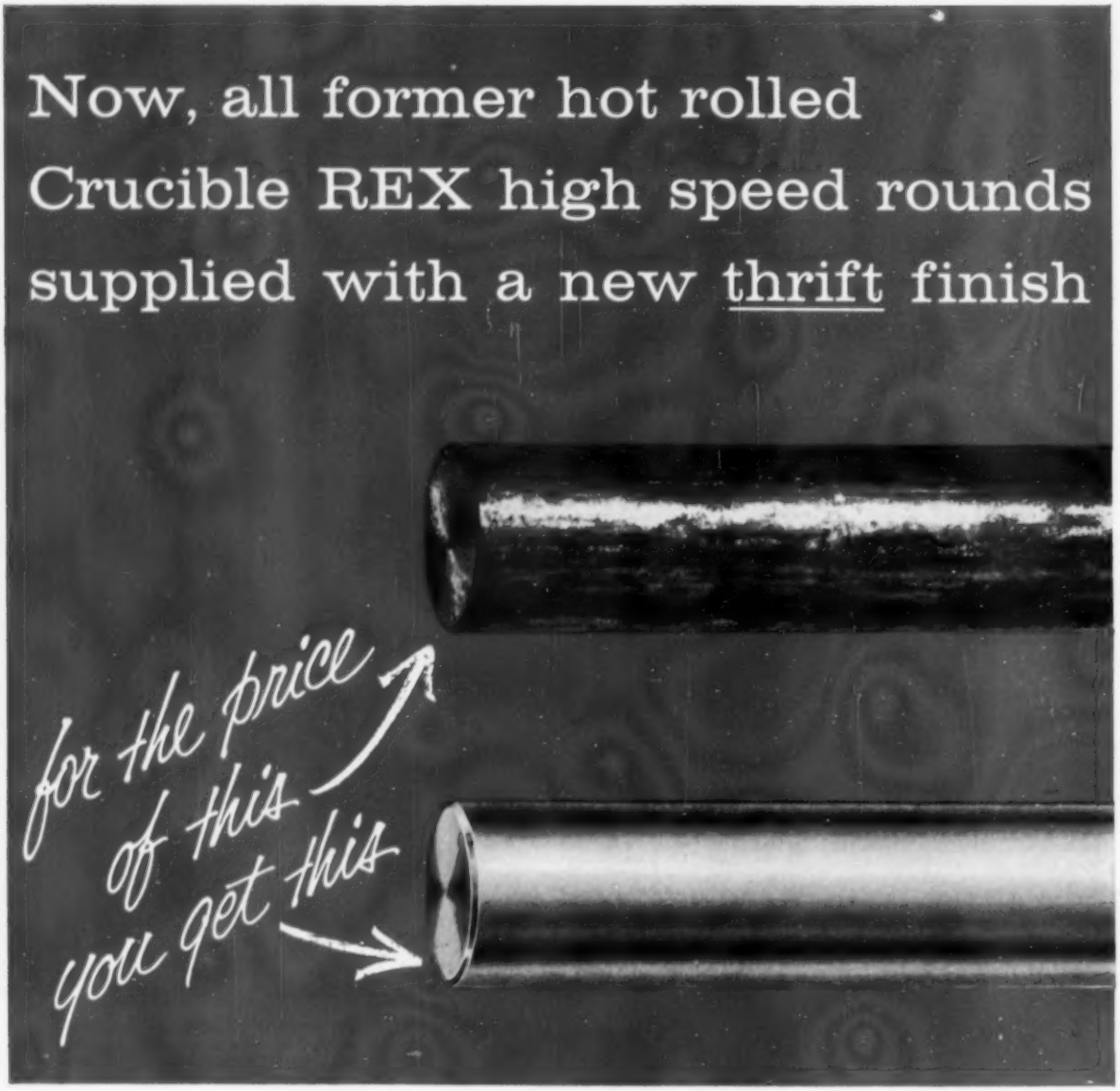
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# Now, all former hot rolled Crucible REX high speed rounds supplied with a new thrift finish




Here's a revolutionary, new Crucible policy designed to provide an improved product—save time and processing costs. Now, Crucible furnishes all REX® high speed rounds from ⅝" up with a machined surface, close to size and free from decarburization. All bars from ¼" to ⅝" round are supplied cold finished.

This new *thrift* finish means important savings to you – whether you've been paying extra for decarburization and stock removal, or grinding or rough turning rounds in your own shop. Of course, where extremely close tolerances are demanded, precise centerless grinding is still available at a small extra.

It's another Crucible "first" that offers you substantially more for your high speed steel dollar. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

Canadian Distributor — Railway & Power Engineering Corp., Ltd.




# PUT your products in the barrel TAKE your profits out

A great way to save money is to barrel finish metal parts by the hundred instead of manually finishing one part at a time.

Next time a job of grinding, deburring or buffing proves too costly on a wheel, try it in a barrel. The results are often so surprising that barrel finishing becomes an exciting and profitable game.

One Oakite customer changed to barrel methods to deburr curved stainless steel strips that are 14 inches long. The cost for deburring 20,000 strips was reduced from $3,000 to $125.

**FREE** For a copy of *"Precision Barrel Finishing"* write to Oakite Products, Inc., 58 Rector St., New York 6, N. Y.

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# When you discover "suddenly

**for production men**

This Avey machine is used in a jet aircraft plant on the West Coast for drilling, boring, and spotfacing the flanges and periphery of a jet engine component.

The two Aveydraulic units mounted horizontally have 12" ram travel. The third Aveydraulic unit, mounted vertically, has 16" ram travel and a 6-speed gear box with a speed range of 150 to 1800 rpm. The vertical column has an in and out traverse of 20"; moves to a minimum of 15" and a maximum bolt circle of 55".

The 60" Electrodex table is equipped with a master index ring with two rows of bushings, 96, 49, and 8 indexes respectively. The three heads can be programmed to the indexing of the table.

Another example of how Avey combines standard units to meet special production requirements.

**for management**

A single buying decision by a competitor can turn your machines into horse-and-buggy relics, and hang a celluloid collar around your unit costs. Suddenly it's 1906 in your plant. Drastic as this may sound, it is quite possible in this day of modern production equipment which can multiply productivity per man-hour and slice pennies off the cost per piece.

Successful managements realize this, and don't wait for competition to take the initiative. Many of them know that it costs them less to purchase an Avey production machine than it does to keep their old equipment.

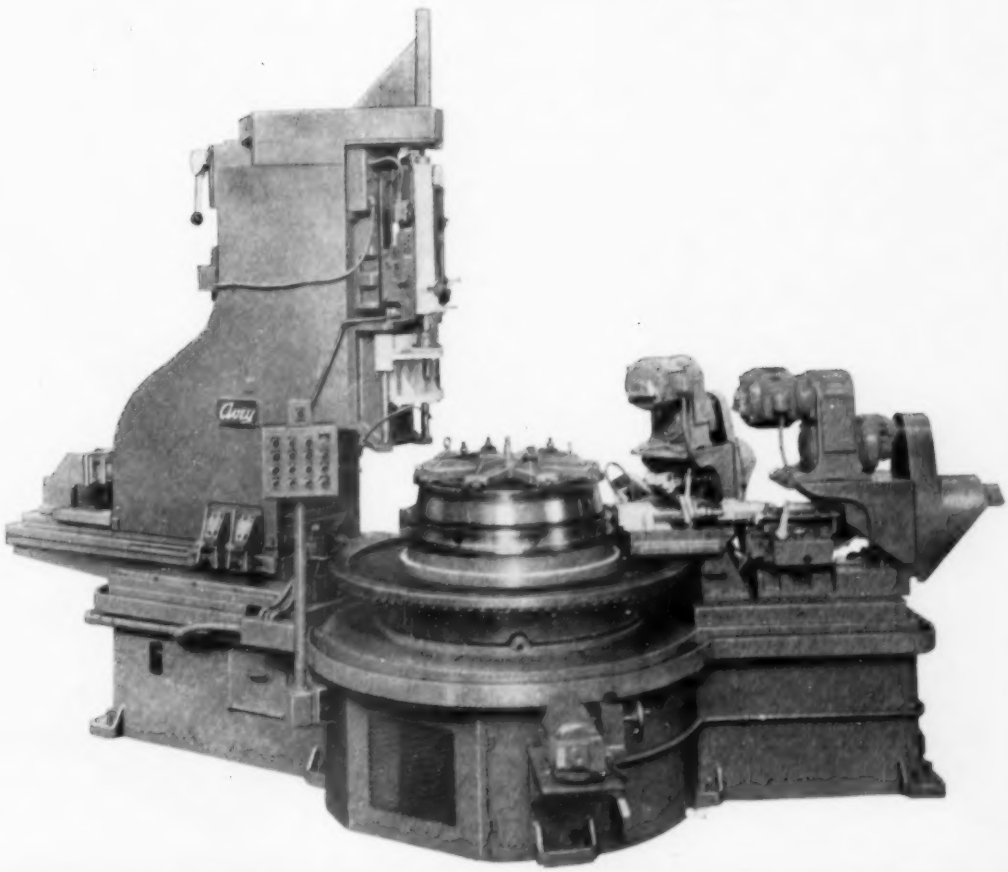
One good reason is that Avey's modular construction permits re-use of units for several different jobs. There are many others which we'll be pleased to tell you about. Avey Division, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, Ohio.

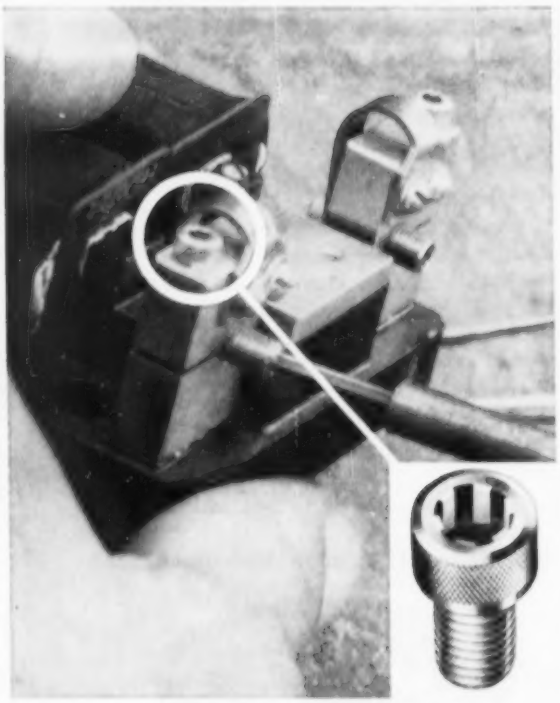
**drilling, tapping, production machines**

# it's 1906"

Avey DIVISION

THE MOTCH & MERRYWEATHER MACHINERY CO.





# They called off test after 20,000,000 operations...

The Bristol Multiple-Spline socket screw still held fast though customer engineers had expected only 2,000,000 operations!

The screw locked and held critical contact adjustment to 0.001" in an ultra-reliable polar telegraph relay. Test was run by the manufacturer, Automatic Electric Company, Chicago, makers of telephone and communication equipment and electrical control devices for industry.

During the 20,000,000-cycle life test, the 0.006" contact space did not exceed the 0.001" allowable tolerance. This was made possible by the Bristol cap screw which locked the adjustment screw in place. This relay—using 4 Bristol socket screws in all—not only has to hold adjustment under operating shocks, but has to operate reliably under extremes of temperature and humidity in outlying railroad telegraph stations. The Bristol screws assure easy adjustment or disassembly when needed.

Reports like this are typical of the outstanding performance Bristol socket screws are giving hundreds of manufacturers of fine products—ranging from electric razors to guided missiles.

Bristol offers the most complete line of socket screws on the market. Hex socket screws—the industry standard—as well as Multiple-Spline. Cap, set, and with every style of point. Sold through leading industrial distributors. Ask for complete data on them today. A-7-1



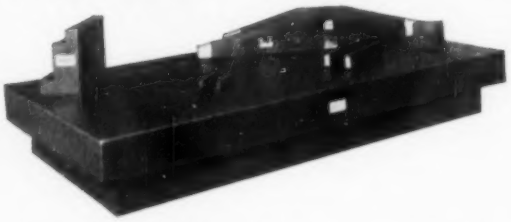

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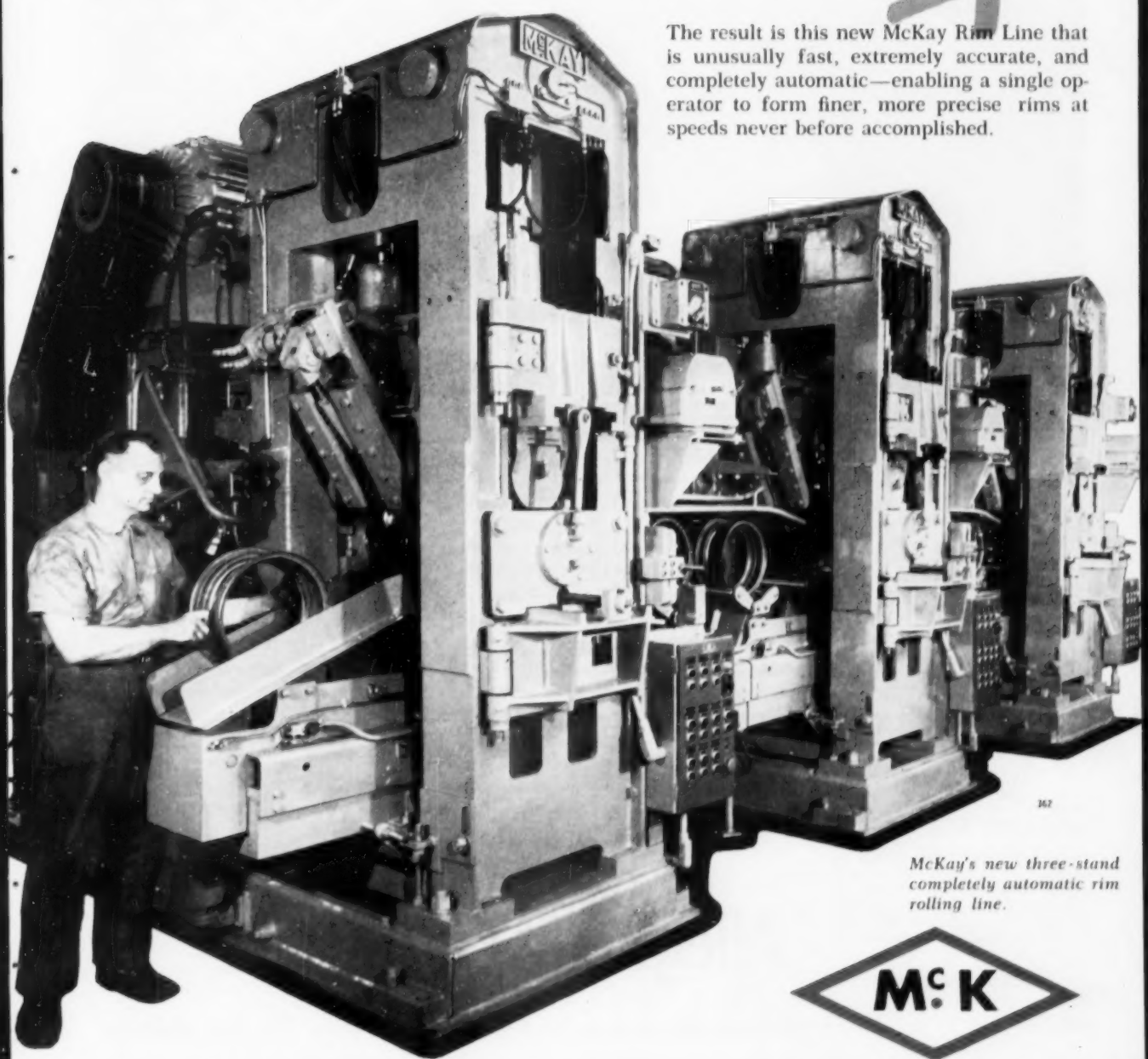
**NEW, AUTOMATED McKAY RIM LINE SPEEDS PRODUCTION OF PRECISION WHEELS FOR TUBELESS TIRES**

The advent of the tubeless tire, coupled with ever increasing labor costs, pushed wheel manufacturers to request machines that could turn out better rims at faster rates.

Because McKay Machine engineers know this business better than any other group in the nation, they accepted the challenge.

# BETTER RIMS ...automatically

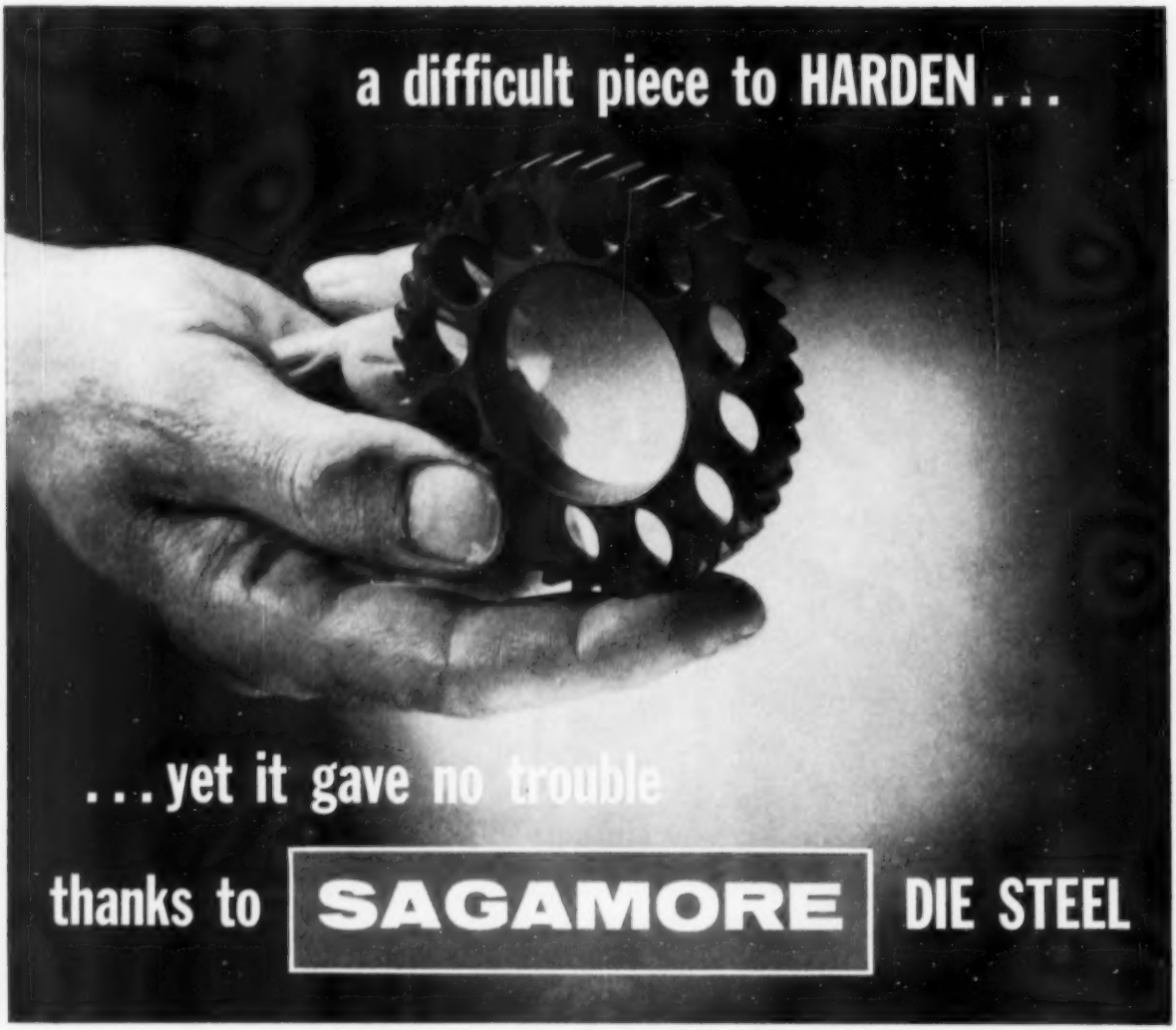
The result is this new McKay Rim Line that is unusually fast, extremely accurate, and completely automatic—enabling a single operator to form finer, more precise rims at speeds never before accomplished.




*McKay's new three-stand completely automatic rim rolling line.*

McK

THE McKAY MACHINE COMPANY • YOUNGSTOWN, OHIO




Note the complex section of this small ratchet driven friction clutch. Yet, with non-deforming Sagamore Die Steel, there is no distortion or size variation in the intricate webbing.

After being machined from a 3" round bar of Allegheny Ludlum Sagamore, the clutch was hardened from 1775 F. The piece was air cooled and then drawn at 600 F. The result, a Rockwell C hardness of 55/56.

Sagamore is a relatively new type of non-deforming die steel which has had a rapid increase in popularity. It combines excellent non-deforming properties and unusual toughness with freedom from hardening hazards. Similar to high carbon-high chromium steels in behavior and applications, Sagamore has the added advantages of lower hardening temperatures, easier machining and grinding, greater toughness and lower costs.

There's an A-L tool steel to help solve your toughest tool steel problems. For further information, call your nearest office or distributor today, or write . . . *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*



**Write for your**
**SAGAMORE BLUE SHEET**

A concise 4-page booklet of facts on the handling and shop treatments of Sagamore. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. *Ask for your free copy.*

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**For nearest representative, consult Yellow Section of your telephone book.**

**For complete MODERN Tooling, call**

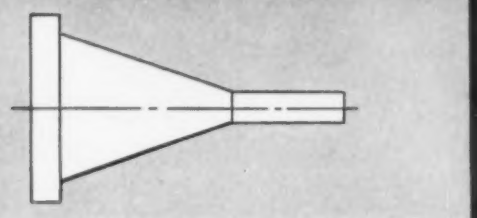
# Allegheny Ludlum

WBW 6523

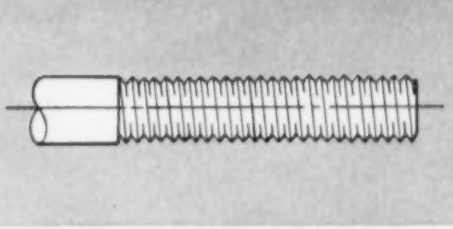
AL ® FINE TOOL STEELS SINCE 1854

*You get*
*top value per dollar*
*with a Hendey No. 2E Lathe*

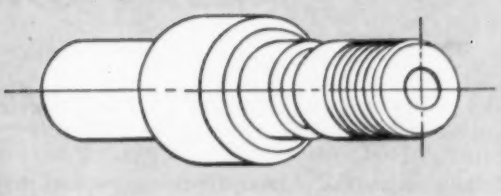
# do all these different jobs better, at exactly the right cutting speeds!



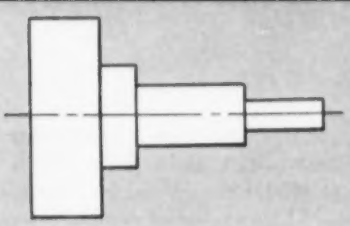
Turn tapers up to 4 in. per ft. — maximum travel at one setting 18 in.



Cut 48 different threads from 1½ to 92 per in. without compounding gears.



Machine parts like these using optional turret tool block mounted on compound rest slide.



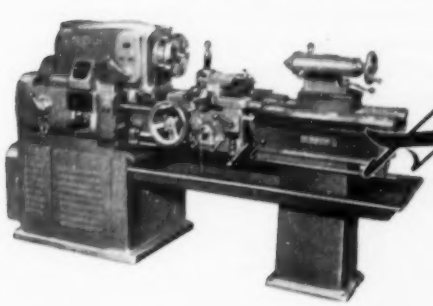
Turn different diameters or face at optimum speeds with electronic speed selector.

Tapers, threads, multiple diameters, and multiple tool-turning — they're all the same on the Hendey No. 2E.

Whatever the job, you know Hendey's infinitely adjustable electronic drive puts the right turning speed at the operator's fingertips. Every control for the cutting tool and spindle is fast, easy, and precise!

Contour turning, too, is available where required. The Hendey No. 2E 14" general-purpose lathe can be equipped *in minutes* with an optional tracer attachment. Learn how quickly this multi-feature lathe will pay for itself in your shop or toolroom. Contact your Hendey dealer for details and complete machine specifications.

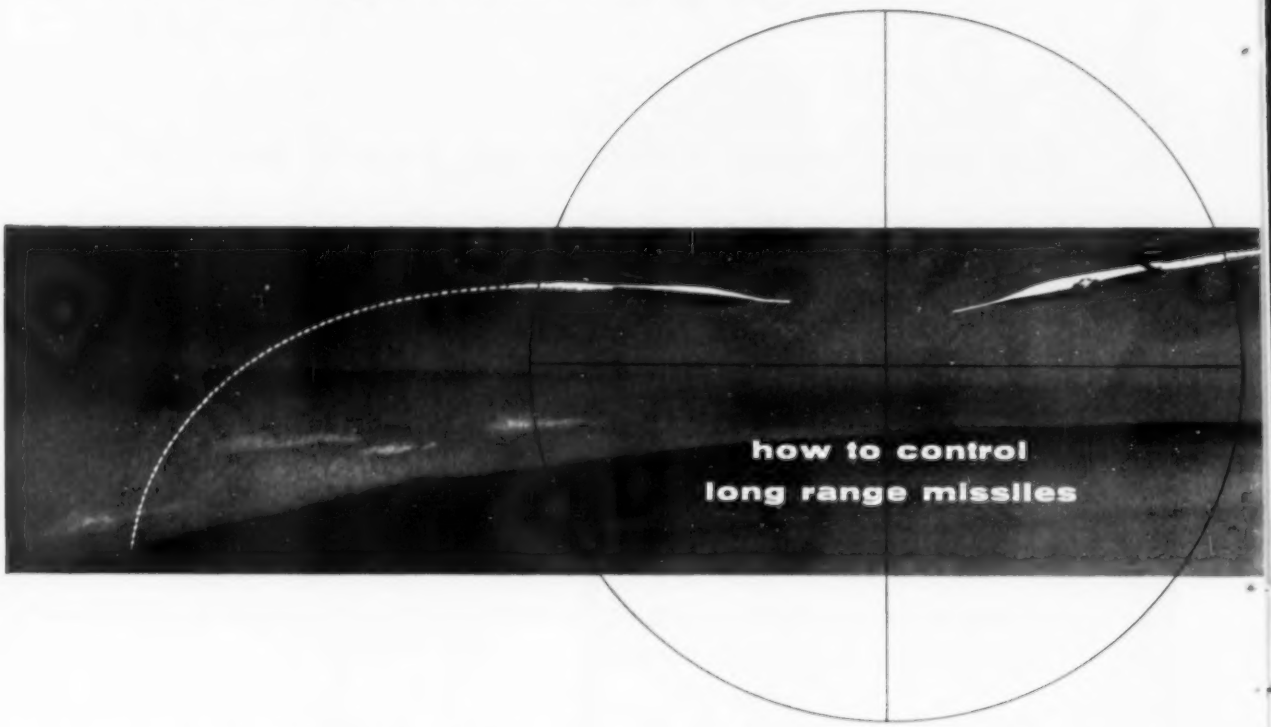
*for precision with production, buy Hendey*



Hendey **machine division**
**BARBER-COLMAN COMPANY**
93 Loomis St., Rockford, Illinois

BARBER COLMAN ®

# *a new concept in gear accuracy!*



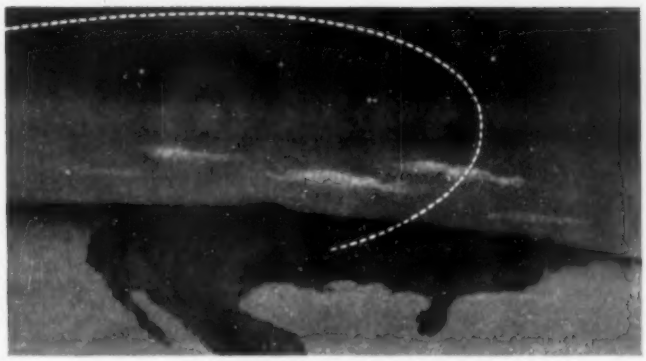

The control systems of modern missiles and aircraft are the "brains" which guide them to the target. Higher speeds, longer ranges and increased altitudes necessitate much more accurate control systems than in the past. One key to greater accuracy is gears made to previously unobtainable tolerances — gears which have an effective angular error of transmission of no more than ten seconds. And since speeds and ranges are increasing almost daily, the trend is toward closer and closer tolerances.

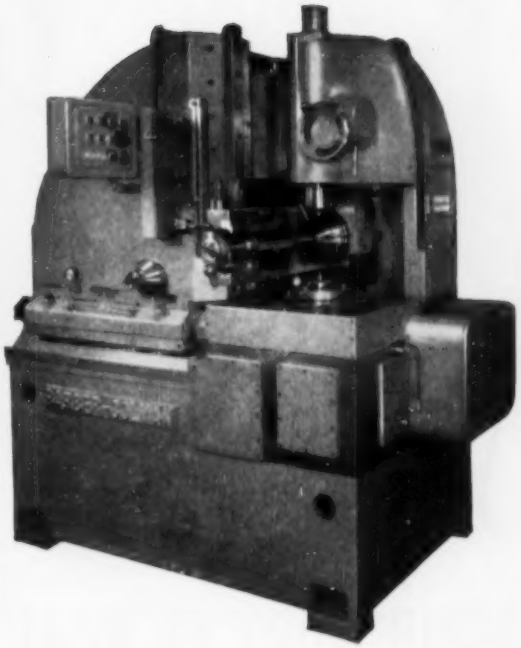
Barber-Colman engineers, working closely with Sperry Gyroscope engineers, have developed a machine and hobs which cut gears to closer tolerances than ever before produced. This machine is known as the "Ultracision" hobbing machine, and it cuts gears which will transmit uniform motion within ten seconds of arc or less, on a gear of 4" diameter. This machine is now hobbing gears *on a production basis* in the Sperry plant.

What does an error of ten seconds mean? It means that a plane flying 5000 miles would be within 400 yards of target at destination if dependent on gear accuracy alone in the navigation system. Five years ago, a one-mile error was good enough, but it is not today. More accurate gears are a primary requirement for these precision controls.

We have been asked to compare ten seconds of angular error to a given amount of total composite error. Such a comparison is not practical because they involve two entirely different methods of inspection. Theoretically, one function of a gear is to transmit uniform angular rotation within the required limits of accuracy. Therefore, the measurement of angular error provides a direct method for determining the rotational accuracy of the gear. Total composite error is the amount of center distance variation obtained by rolling a gear with a master gear or rack. This method provides a relative measure of gear accuracy.

In trying to obtain the very finest gears, Sperry engineers have developed a method of inspecting angular errors with fantastic accuracy. They can now measure angular error between any corresponding points on gear teeth profiles to an accuracy of one-half second of arc. This method measures the effect of spacing, lead and profile errors. Presently allowable errors cannot exceed ten seconds of true angular displacement at any diameter along the involute.





One of the most important features of the "Ultracision" hobbing machine is the accuracy of the relative rotation between the work spindle and the hob spindle. This is probably the most important single feature affecting accuracy of gears produced. This relative rotation was inspected dynamically by means of a theodolite and a camera. All other machine elements were made to extremely small tolerances, resulting in hobbed gears within the required tolerance of ten seconds.

Original hobs for this machine were made to one-half the tolerances of Class AA hobs. However, tests showed that hobs made to Barber-Colman Class AA tolerances were accurate enough for this application, and they are now being used on this machine. Although Class AA tolerances are used, the hobs are really more accurate than these tolerances would indicate because the diameter is over twice the diameter of a standard hob of an equivalent pitch.

Since Barber-Colman engineers have designed and built the hobbing machine which cuts the world's most accurate gears, they have the experience to recommend the machine to produce gears to your accuracy requirements. In most cases, standard-type machines will satisfy your requirements. On our most accurate standard-type machine, we guarantee that it will hob a 4" PD, spur gear within .0002" adjacent and .0004" non-adjacent spacing error.

We invite you to submit your gear specifications and problems for analysis and recommendation by our engineers.

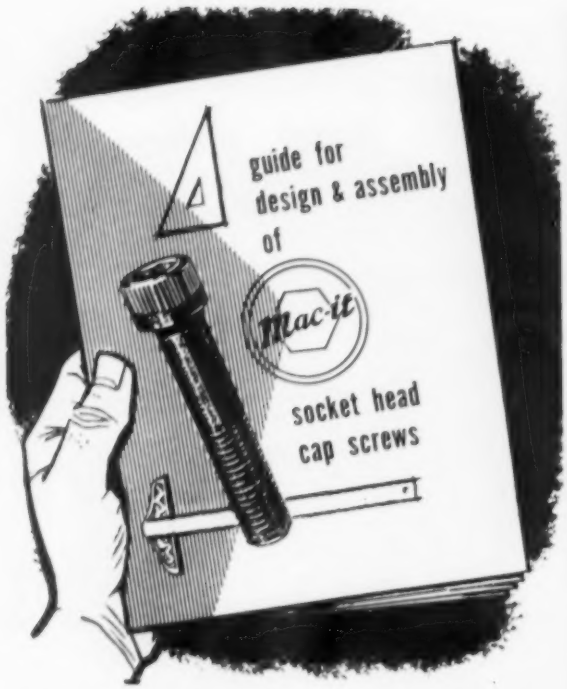
For more information about the "Ultracision" hobbing machine, write for descriptive literature.

**BARBER-COLMAN COMPANY**

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BARBER COLMAN




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Send today for this brand new 8-page guide for the design and assembly of Mac-it Socket Head Cap Screws. It contains valuable information on these widely used fasteners, much of it new and never published before, including:

**TORQUE-TENSION DATA** — Exclusive, easy-to-use graphs show tightening torque required to produce desired screw tension. Torque and tension recommendations are shown to simplify accurate, efficient design and assembly.

**COMPLETE TECHNICAL INFORMATION** — Highly useful reference data on these screws includes physical characteristics, specifications, dimensions, thread lengths for standard stocked sizes and other helpful information.

Every design engineer, draftsman and production supervisor should have a copy. You can get yours from your local Mac-it distributor or write: Mac-it Screw Division, Strong, Carlisle & Hammond, 1392 W. 3rd Street, Cleveland 13, Ohio.

---

That same distributor also maintains complete, local stocks of
**America's first and finest alloy steel screws**

Socket Head Cap Screws • Button Head Socket Cap Screws • Flat Head Socket Cap Screws • Hollow Set Screws • Hollow Lock Screws • Hollow Pipe Plugs • Socket Shoulder Screws • Hexagon Head Cap Screws • Square Head Set Screws • Tool Post Screws • Square Head Collar Cap Screws • Slotted Headless Set Screws • Hex Socket Keys

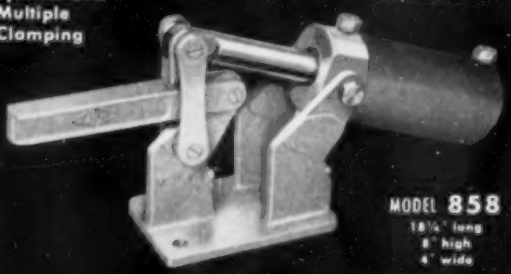
**MAC-IT** hex socket / alloy cap & set **SCREWS**

USE READER SERVICE CARD; INDICATE A-9-264-1

presenting...the NEW

DE-STA-CO **Clamp-omatic**
AIR OPERATED
**TOGGLE CLAMP**

for Positive Split-Second Multiple Clamping



MODEL **858**
18¼" long
8" high
4" wide

- EXTRA HEAVY DUTY
- HARDENED BUSHINGS at all pivot points
- COMPONENTS EASILY REPLACED due to screw-type construction
- FORGED STEEL COMPONENTS

Holding Pressure to 2,000 Pounds with Normal Air Line Pressure of 90 Pounds. Weight 16 lbs.

Write today for Literature on this new DE-STA-CO CLAMP-OMATIC, Model 858, as well as Models 810-U and 810-S.



DE-STA-CO **DETROIT STAMPING COMPANY**
WORLD'S FIRST LINE OF TOGGLE CLAMPS
328 Midland Avenue • Detroit 3, Michigan
USE READER SERVICE CARD; INDICATE A-9-264-2

CONCENTRIC LIVE CENTERS *the original, patented*

**SPRING LOADED LIVE CENTERS**



**AUTOMATIC THRUST ADJUSTMENT**

Spring loaded spindle maintains constant tail stock thrust.

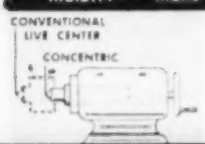
**LONGER LIFE**

Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

**FASTER SPEEDS**

Smaller turning radius gives much higher RPM rate than ordinary live centers.

LESS OVERHANG MEANS MORE RIGIDITY . . MORE WORKING RANGE




GREATER LOAD CAPACITY

JAM PROOF

PAT. NO. 2,510,473

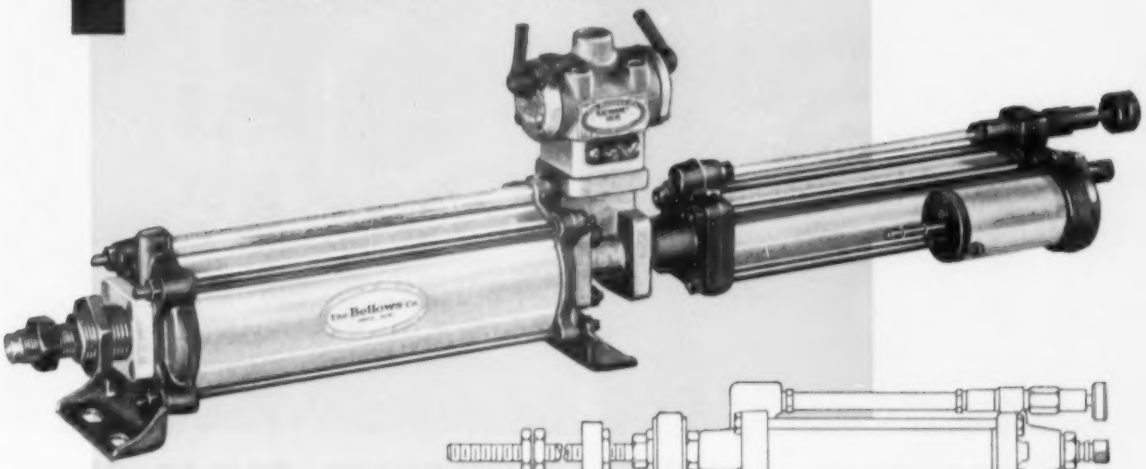
Write for more information

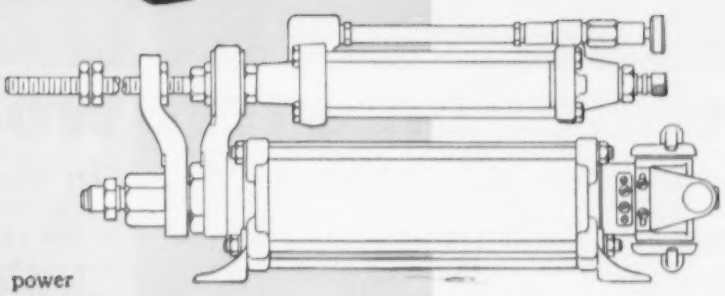
**CONCENTRIC TOOL CORP.**, 2486 Huntington Dr. San Marino, Calif.

USE READER SERVICE CARD; INDICATE A-9-264-3

# This AIR CYLINDER features—

**1** BUILT-IN *HYDRAULIC CONTROL*
**2** BUILT-IN *ELECTRIC CONTROL*
**3** BUILT-IN *SPEED CONTROLS*





In one compact packaged power unit are built-in controls to cover every phase of air cylinder operation. Built-in hydraulic control of piston rod movement gives the smoothness characteristic of hydraulic operation, yet retains the speed and flexibility of air power. Built-in electrically controlled directional valve permits quick, positive, push button remote control, or easy electrical synchronization with other machine elements. Built-in speed controls permit exact control of piston rod speed in either or both directions.

This combination of Bellows Air Motor and Hydro-Check is available in five bore sizes: 1¼", 1¾", 2½", 3⅝" and 4½" in standard stroke lengths up to 18".

Here is air cylinder power at its best—fast, flexible, safe, and smooth.

**BULLETIN ML-3 TELLS THE STORY. WRITE FOR IT TODAY!**
**DEPT. TE-957**

## The Bellows Co.

**AKRON 9, OHIO**

**TWO MOUNTING STYLES**

*The Bellows Air Motor and Hydro-Check (Model HCB-EM) is available arranged in tandem as shown above, or in parallel, as sketched.*

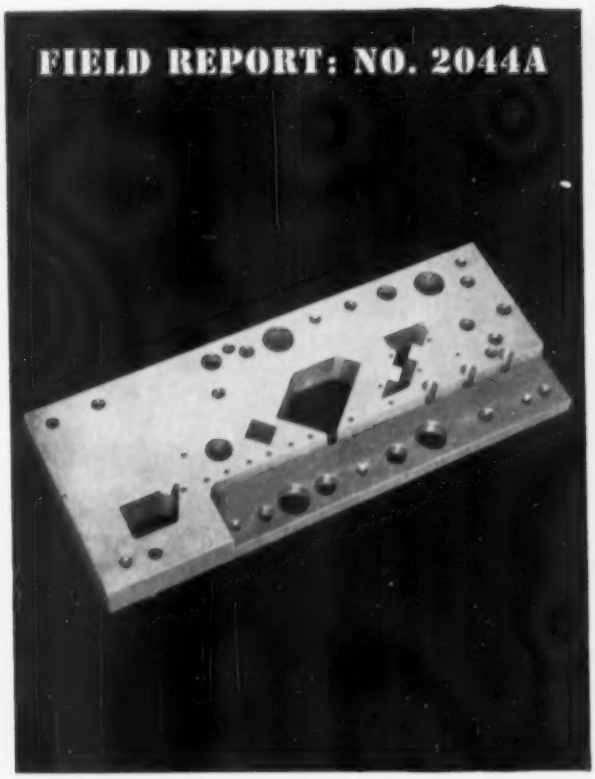
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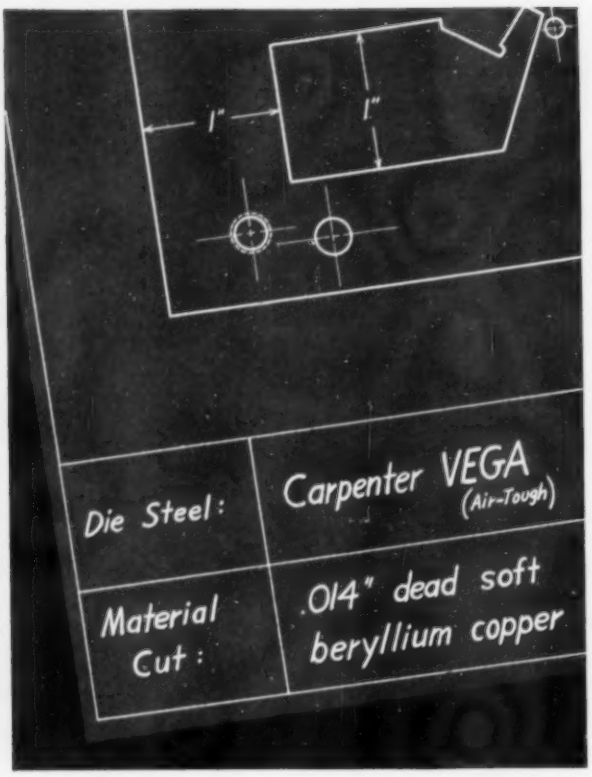
*Combination units of Air Motor and Hydro-Check are also made with any one of six other Bellows directional valve arrangements; and, of course, Air Motors and Hydro-Checks are available as separate units.*

*Controlled Air-Power*

**FOR FASTER, SAFER, BETTER PRODUCTION**

1381-A




# WHICH DIE STEEL WOULD YOU USE

## *for hardening accuracy, safety in this critical die section?*

Imagine the problems involved in making and heat treating this critical die section for cutting parts from .014" dead soft beryllium copper.

Numerous cut-outs, sharp corners and thinner sections milled almost through the length of the die present man-size problems in getting the section out of heat treatment safely and accurately.

Which die steel would you be willing to trust on this ticklish job?

Here are the results reported by the diemaker, who chose Carpenter VEGA (Air-Tough) Die Steel for the job: "The section is made from a piece of VEGA 1" x 5" x 12". To hold the stock in line, we had to jig bore and hold a line of ⅛" pilots almost through the entire die length. VEGA permitted us to do this and saved *many hours of work* over a die made from small sections. The first large perforating punch was also made from VEGA. After heat treatment, the punch *entered the die perfectly*. If there was any warpage at all in the punch, we couldn't find it."

This kind of performance is readily available to you by simply calling your nearest Carpenter Mill-Branch Warehouse, Office or Distributor. Large local stocks of Carpenter Matched Tool and Die Steels assure immediate delivery.




Carpenter STEEL

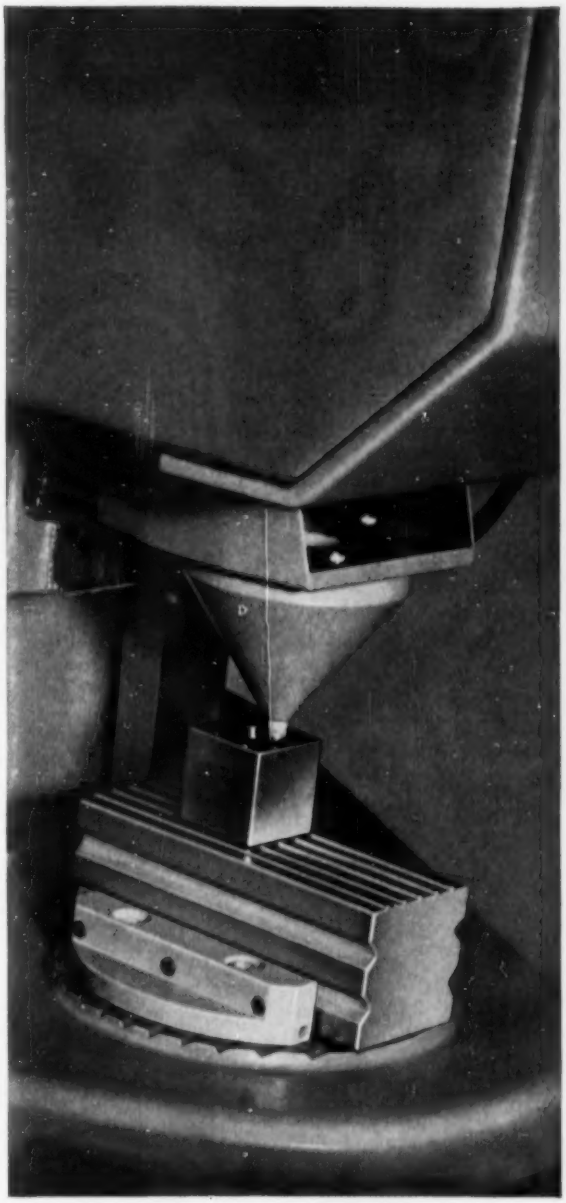
**Matched Tool and Die Steels**

The Carpenter Steel Company, 154 W. Bern St., Reading, Pa.

*Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"*

® U. S. Patent Office, The Carpenter Steel Co., Reading, Pa.

# THE FRINGECOUNT* MICROMETER



## DIRECT MEASUREMENT TO 0.000001"

## SIMPLE TO OPERATE...DIGITAL READING

The new FRINGECOUNT micrometer brings laboratory precision with increased speed to your inspection and quality control departments.

This new precision instrument is particularly suited to the measurement of gage blocks, plug gages, other external standards as well as close tolerance production parts.

The most stable measuring standard known – the wavelength of light – is the gage put to use in the FRINGECOUNT micrometer. It combines the interferometric principle with an electronic system which counts light fringes – projects them into a digital counter for fast interpretation into a dimension.

Operation is simple – just *two* push-button controls. Other FRINGECOUNT advantages:

- Eliminates need for expensive master blocks.
- Measures flat or round parts equally well, equally fast.
- Adapts to many special measuring situations through the use of different anvils and spindles.
- Requires no calibration. As stable as the light source.

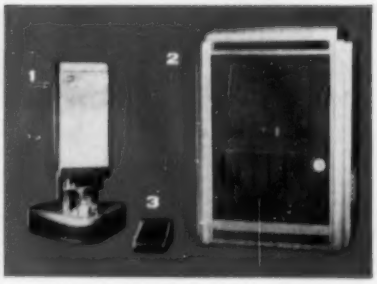
Find out how the FRINGECOUNT can be used in your operation; Write us today, Department E-7 for Bulletin LP-3521.

*Trade Mark of Link Aviation.

1 **INTERFEROMETER** . . . high stability of the mechanical and optical system assures extreme accuracy — up to 0.000001" — throughout the FRINGECOUNT'S 0 to 2" range.

2 **COUNTER** . . . EASY TO READ COUNTER gives instantaneous digital presentation of light fringes which are directly interpretable into a dimension.

3 **CONTROL UNIT** . . . push button controls provide bi-directional operation of the motor driven head and zero setting of the instrument.



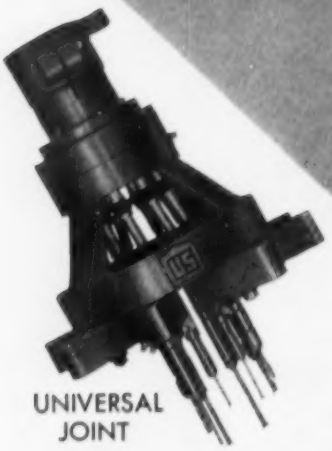

LINK AVIATION, INC.

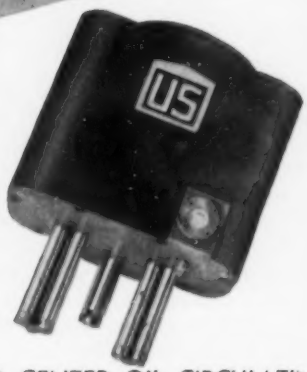
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

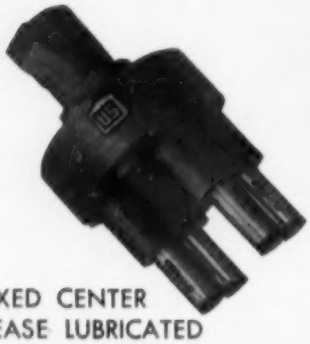
BINGHAMTON, NEW YORK

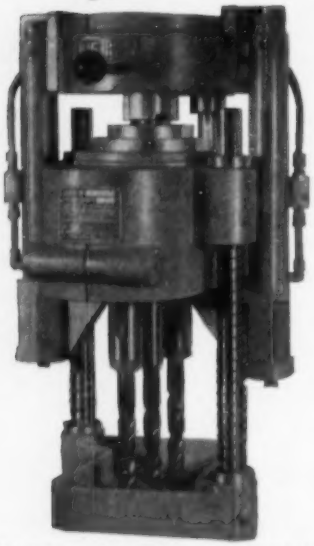
GPE

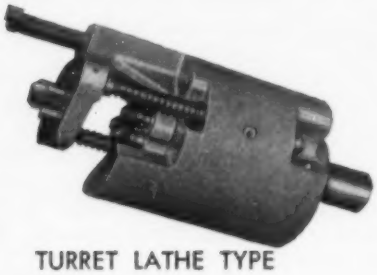
# For men who know Drill Heads Best...
## it's always
# U. S. DRILL HEAD
# 5 to 1


UNIVERSAL JOINT

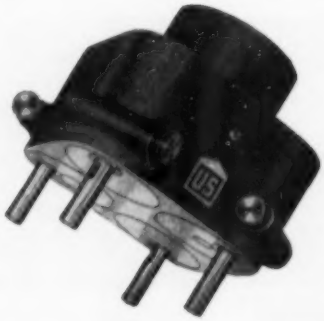

FIXED CENTER OIL CIRCULATING


FIXED CENTER GREASE LUBRICATED


RADIAL SWIVEL ATTACHMENT WITH AIR COUNTERBALANCE


TURRET LATHE TYPE

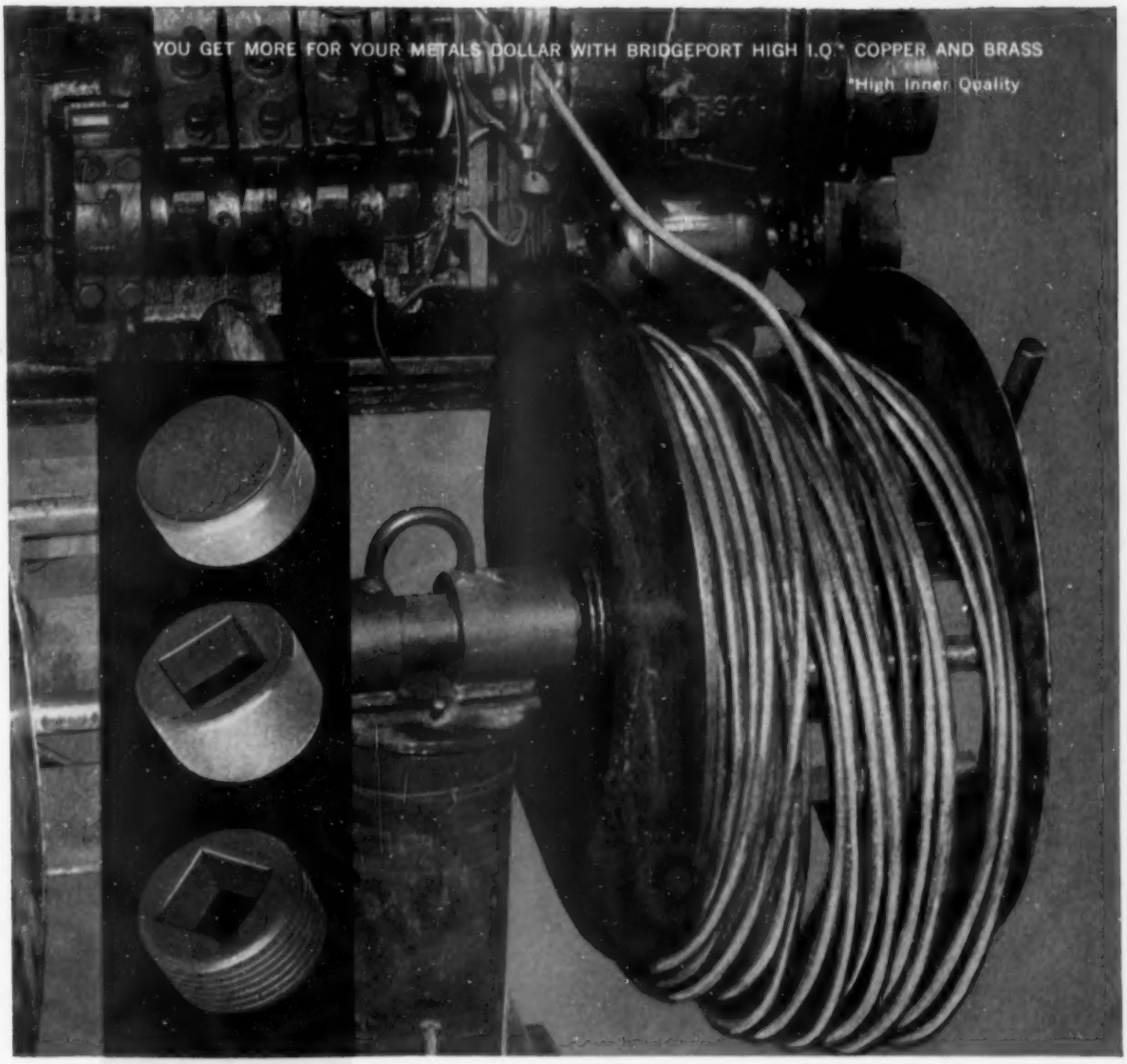

INDIVIDUAL LEAD SCREW TAPPER


STANDARD ADJUSTABLE

US DRILL HEAD

**UNITED STATES DRILL HEAD CO.**

BURNS STREET • CINCINNATI 4, OHIO




Progressive steps in the manufacture of a Pittsburgh Plug from Bridgeport Wire. Part is cut off, upset to form a tapered blank and roll threaded.

# Easy on the dies... Bridgeport cold heading wire

The pipe plugs illustrated are just one of many different cold headed and cold rolled products made by Pittsburgh Plug & Products Co., Pittsburgh, Pa. When you're producing products such as these in such variety and in large volume, you have to be mighty careful on materials specifications. You need an alloy that not only readily cold forms but which will hold prescribed tolerances at high production rates. Otherwise, scrap losses and rejects mount up.

The answer in this case was Bridgeport Yellow Brass Wire, Alloy #16, the most popular and versatile of Bridgeport cold heading wires. Used in a scrapless nut former which makes possible a materials savings in excess of 40%, Alloy #16 meets all the requirements of the job which calls for wire to a prescribed OD with rigid tolerance specifications.

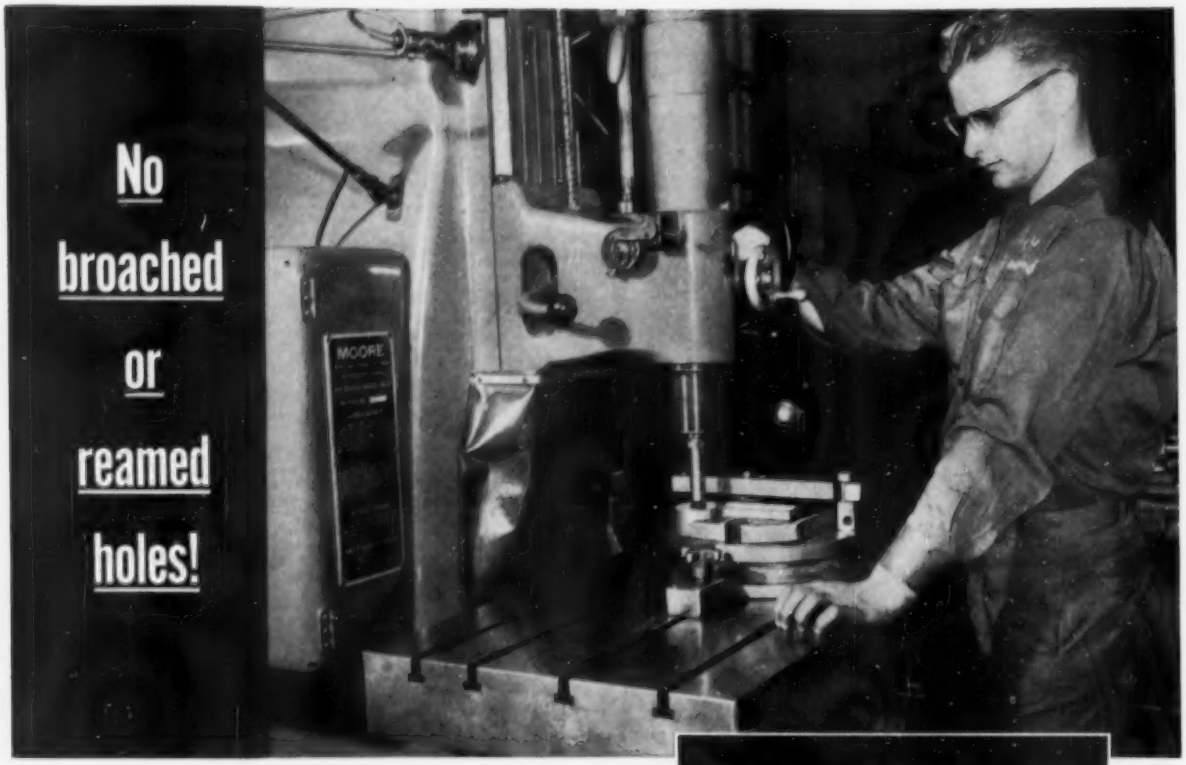
Yellow Brass Wire is just one of the many Bridgeport alloys for cold heading. It will pay you to check with your local Bridgeport Sales Office for help in selecting the alloy best suited to your production and product method. Our Service is prompt, dependable, backed by Bridgeport's Technical Service.

*matched* Bridgeport Brass Alloys *to your job*

**BRIDGEPORT BRASS**

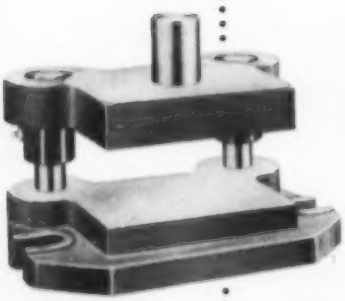
Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Connecticut
In Canada: Noranda Copper and Brass Ltd., Montreal




They're precision bored on master plates to give you absolute interchangeability between any die shoe or punch holder

# DANNEMAN PRECISION DIE SETS



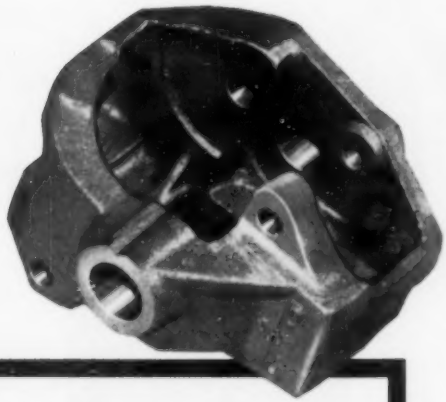
Danneman die sets are precision built every step of the way to assure long, trouble-free production accuracy. You can be sure of perfect alignment because we finish Thompson-grind all four horizontal sides . . . assemble with cylinder square fixtures to insure squareness of leader pins and bushings. Even the U-lugs are machined for additional clamping accuracy.

Bushings and leader pins with lubricating devices are Lamina precision hardened and ground — or if you prefer a low cost die set, we can supply regular plain hardened and ground steel bushings with lubricating grooves on the guide posts.

Specify *Danneman* precision die sets on your next job and *see* the difference. Catalog on request.

DANNEMAN
DIE SET DIVISION

**ACME-DANNEMAN CO., INC.**
*Sales Offices:* 45 West 18th St., New York 11, N. Y.
ALgonquin 5-7150 *Works:* 203 Lafayette St., New York 11, N. Y.

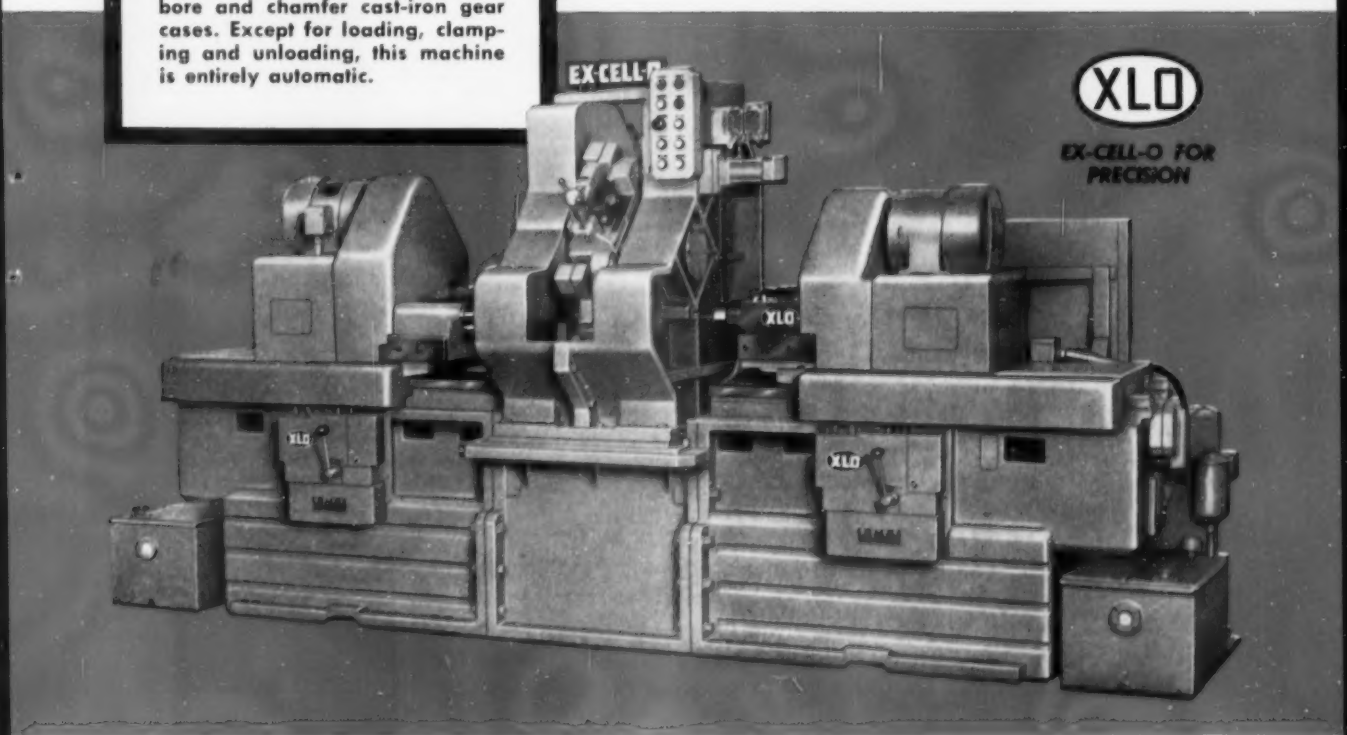


# Lowers Cost of Gear Cases– Speeds Production!

## Ex-Cell-O 2-Way Machine

**ABOVE: Gear case after machining. Hole sizes are held within .0005", centers .001".**

**BELOW: This Ex-Cell-O Precision Two-Way Machine equipped to bore and chamfer cast-iron gear cases. Except for loading, clamping and unloading, this machine is entirely automatic.**




Typical of Ex-Cell-O's constant improvement in the field of precision production is this Two-Way Precision Boring Machine.

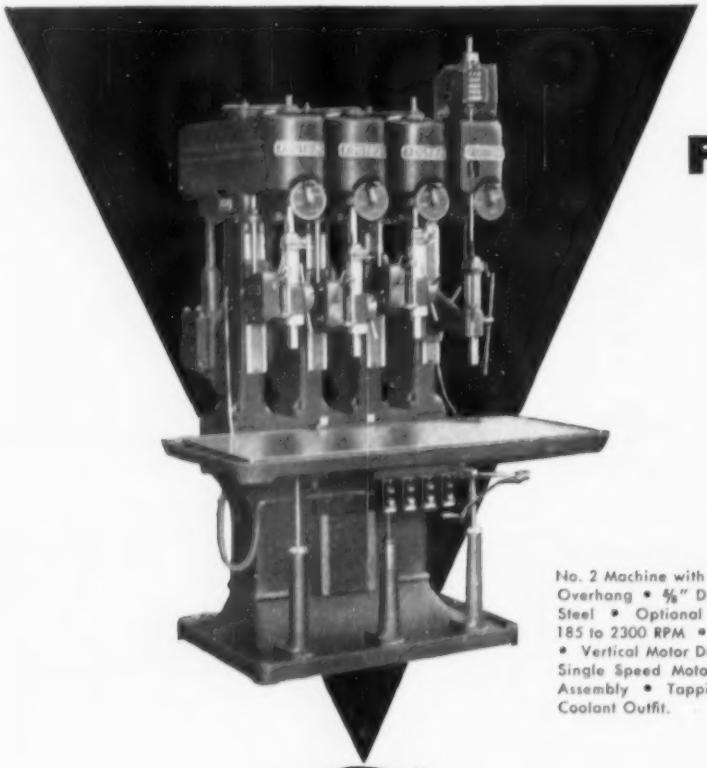
Operations on the cast-iron gear case illustrated include finish boring seven holes and chamfering diameters at two points. With its new hydraulic control panel each way unit has a greater range of feeds and a higher rate of rapid traverse.

Like all standard Ex-Cell-O Machines, this Two-Way Model is easily adapted at slight cost to a variety of precision setups. For further information, contact the Ex-Cell-O representative in your area, or write, wire or phone direct to Ex-Cell-O, Detroit.

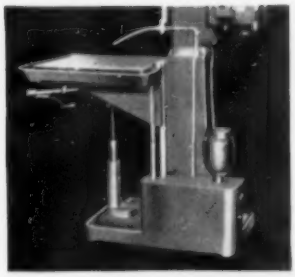
**EX-CELL-O**
CORPORATION
DETROIT 32, MICHIGAN

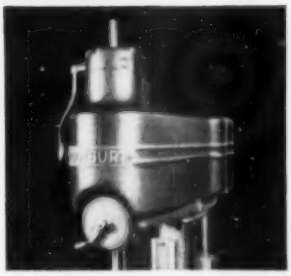
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

57-2

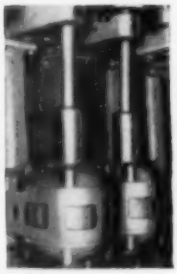


# FOOTBURT





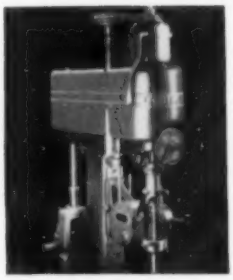
No. 2 Machine with Back Gear • 12" Overhang • 5/8" Drilling Capacity in Steel • Optional Speed Ranges • 185 to 2300 RPM • 280 to 3450 RPM • Vertical Motor Drive with Standard Single Speed Motor • Power Feed Assembly • Tapping Attachment • Coolant Outfit.



# *Sensitive* drilling machines

***A FULL RANGE DRILLING MACHINE ENGINEERED FOR PRODUCTION***

Built carefully to provide the required accuracy for fine tool room work, Footburt Sensitives are designed with the weight and stability to maintain close tolerances on day after day production work. The correct speed for a wide range of drilling, reaming, and counter-boring operations is instantly available. Write for full information on this great line of Sensitive Drilling Machines. Built in 1, 2, 3, 4, 6 Spindle Models.



**THE FOOTE-BURT COMPANY • Cleveland 8, Ohio**

Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.

**ENGINEERED FOR PRODUCTION** *Write for Circular #508A.*

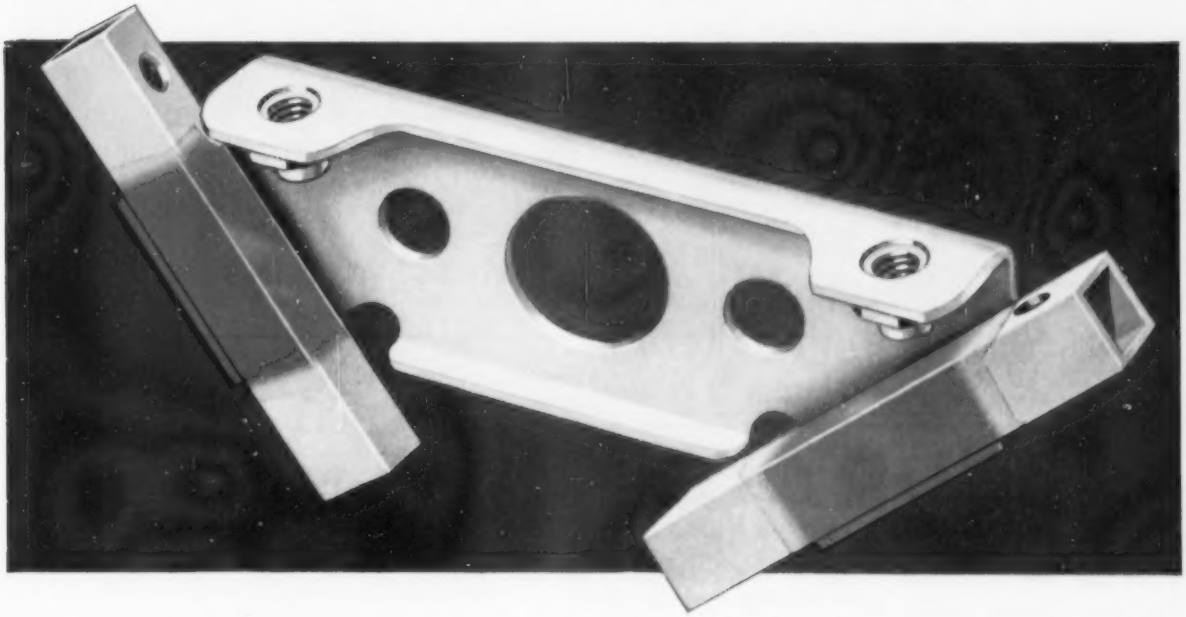
# FOOTBURT

## MACHINE TOOLS



# Jack & Heintz Saves $15.84 Per Hour...

## *with* TOCCO* *Induction Brazing*



**Brazing Costs Down**—When Jack & Heintz engineers switched from torch brazing to automatic induction, brazing cost of these inverter brush mounts fell from $.05 to $.006 each—a reduction of 83% in direct labor costs alone! Additional savings result because less cleaning is required after TOCCO, and fuel costs are much lower, too.

**Brazing Production Up**—While costs dropped, production on the part zoomed—from 40 to 360 brazed assemblies per hour. Furthermore, rejects and scrap, formerly high, are now negligible.

**Versatility**—The part shown is just one of over 25 parts, large and small, which alert J & H engineers have converted from old-fashioned brazing methods to modern, automatic TOCCO. Overall brazing costs (TOCCO brazing versus former methods used) are down 75%—brazing speed, up 100%.

If the manufacture of your product involves brazing, heat-treating, forging or melting of ferrous or non-ferrous metals, don't overlook TOCCO as a sound method of increasing production, improving product quality and slashing costs.

TOCCO

JUST PUSH A BUTTON

THE OHIO CRANKSHAFT COMPANY

*Mail Coupon Today* — NEW FREE Bulletin

The Ohio Crankshaft Co. • Dept. G-9, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering".

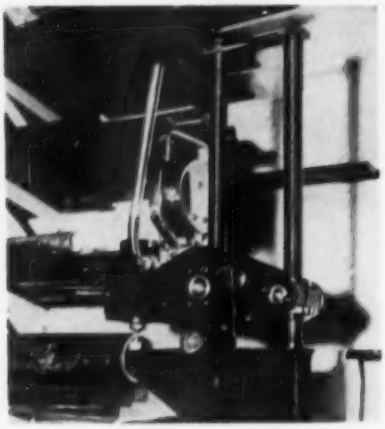
Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____



## *Accuracy in Hardness Tests insures Quality Control*

Solve quality control problems with the King Portable Brinell Hardness Tester. Take faster, more accurate hardness readings on heavy, odd-shaped metal parts without elaborate fixturing or cutting samples. The King Portable uses a 3000 kg. load on a 10 mm. ball with automatic relief. Intermediate loads as desired. This precision instrument saves handling and set-up time, and is so versatile, it soon pays for itself many times over. Weighs less than 30 pounds and makes guaranteed accurate tests anywhere.

***For complete specifications on standard testing machines or adaptations made to your special requirements, write***

**KING TESTER CORPORATION**

**Dept. T, 440 North 13th St., Philadelphia 23, Pa.**

USE READER SERVICE CARD; INDICATE A-9-274-1

# ACCURACY .0002 T.I.R.

.0002 T.I.R. or less at Spindle Nose, .0005 T.I.R. or less on Test Arbor six inches from Spindle Nose

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

**MODEL B943 MOTOR DRIVEN WORK HEAD**

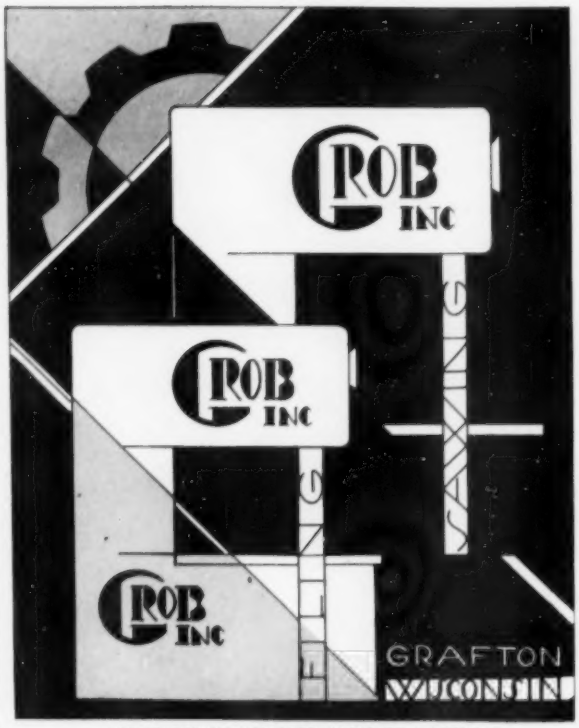


No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

Clip ad to your letterhead and send for Literature

**K. O. Lee Company, Aberdeen, S. D.**

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***The Middlestadt Machine Co.***

4210 Chesmont Ave. Baltimore 6, Md.

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CONTAINS CONDENSED PRACTICAL AIDS FOR EXPERIENCED

***Revised Edition Contains Answers to Over 1000 Practical Die Problems With Use of Direct Reading Tables and Formulas.***

## DIE MAKERS

ALL IN ONE COMPACT HANDBOOK... direct answers to die problems. Saves time. Eliminates mathematical calculations. Avoids costly errors. Contains invaluable formulas and tables for quick reference.

Formulas and Direct Reading Die Tables on the following types of dies: Bending and Forming Dies, Blanking Dies, Drawing Dies, Square and Rectangular, Drawn Shells, Miscellaneous Tables and Charts.

**CUT OUT THIS AD TODAY!**

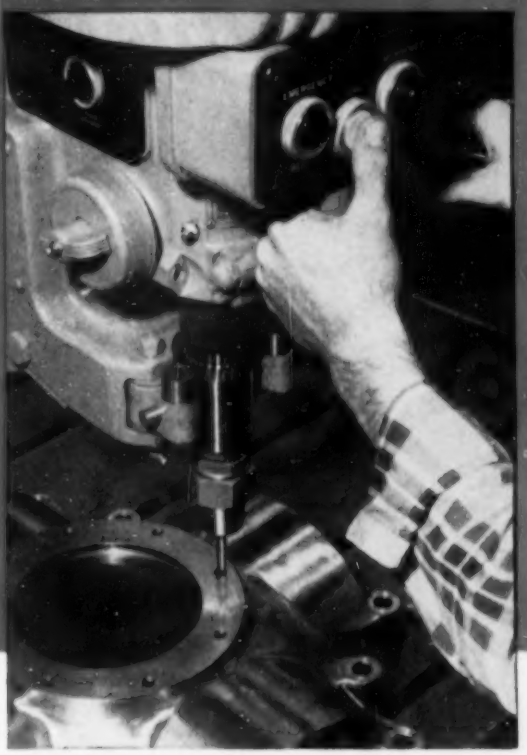
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# Another Bath Tap job well done . . . for UNITED AIRCRAFT CORPORATION

## HAMILTON STANDARD DIVISION



Specially designed Bath Tap is shown threading four-way barrel of steel that forms hub of four-bladed Hamilton Standard propeller, Model 34G60.

**PROBLEM**

**Two passes were required to produce ⅜"-24NF3 bottoming holes ⅝" deep in Hamilton Standard steel propeller hubs—one pass for machine-driven roughing tap and one pass for hand-driven finishing tap.**

**SOLUTION**

**One Bath Tap now does the entire job by machine—faster and better . . . in a single pass.**



Model 34G60 four-bladed Hamilton Standard propeller, installed on Air Force tanker plane.

Bath engineers and craftsmen helped solve this tapping problem for Hamilton Standard and helped to improve the efficient production of an important component. This same sort of service is yours for the asking!

In addition to the design and manufacture of special custom-built taps, Bath has a full line of regular taps and precision gages in standard types and sizes. A request on your business letterhead will bring full information.

**JOHN BATH & CO., Inc.**

**28 Mann St., Worcester, Mass.**

CYLINDRICAL AND THREAD GAGES • GROUND THREAD TAPS
INTERNAL MICROMETERS

# Now—*from Behr-Manning's*



**New "SPUR-ACTION" abrasive belt cuts 25% Faster.**

Removing excess material from a cast brass spring housing for a pressure reducing valve is fast and easy with a new "81-Coat" Resinall Metalite abrasive belt. The new Behr-Manning abrasive belts not only do a faster stock removal job but also stand up longer than any previously used.

# "Abrasive Tech"—

**BEHR-MANNING CO., TROY, N. Y.**

☐ Please have a Field Engineer contact me to arrange for a demonstration of your new "81-Coat" belts and discs.

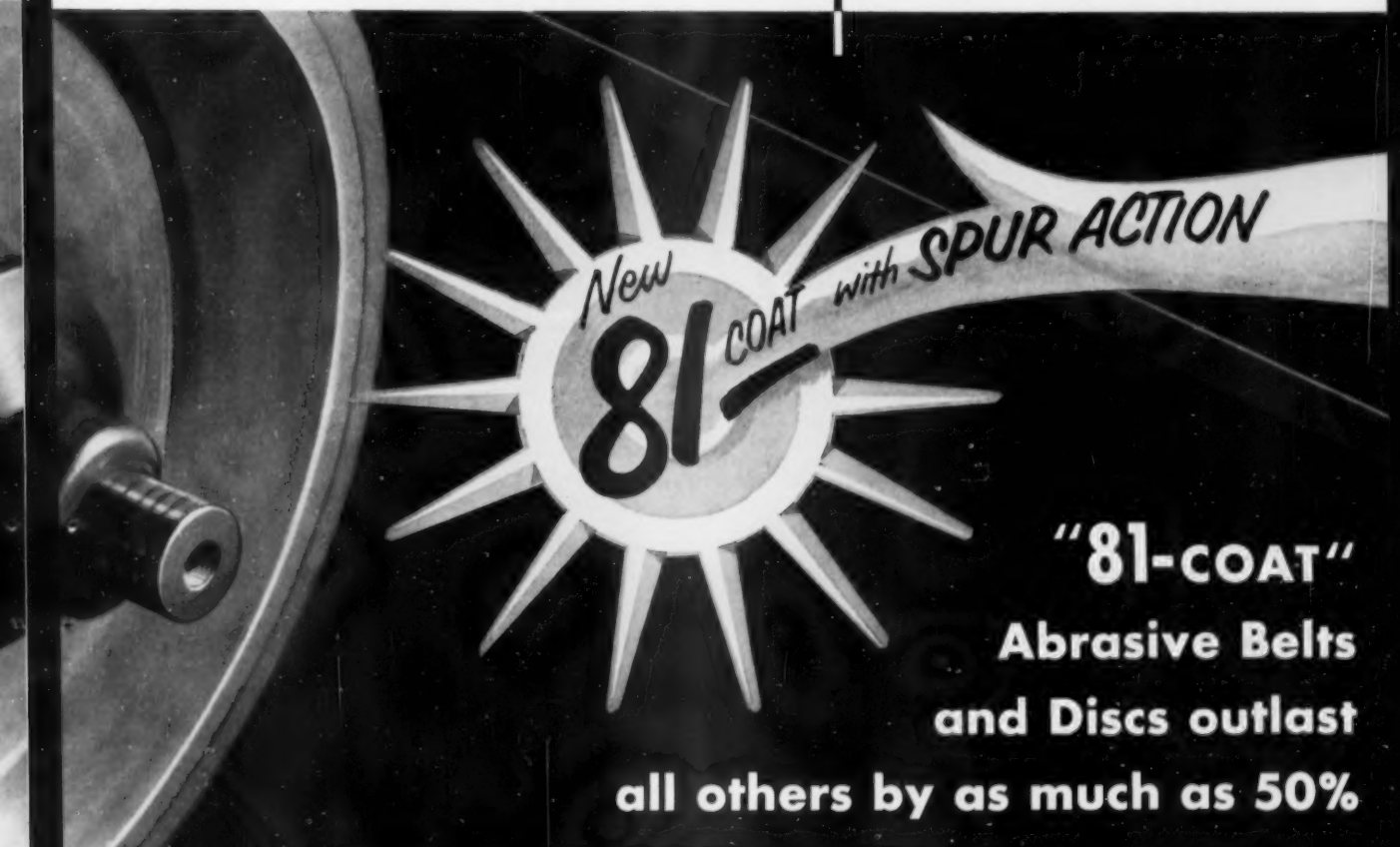
☐ At my plant ☐ At your nearest "Abrasive Tech" Branch Methods Room

*Name* _____

*Company* _____

*Address* _____

*City* _____ *Zone* _____ *State* _____




## "81-COAT" Abrasive Belts and Discs outlast all others by as much as 50%

From the Research Laboratory of Abrasive Tech comes an entirely new way of making coated abrasives—"81-Coat."

It gives a new toughness . . . a new sharpness to abrasive belts and discs. It gives them "Spur-Action"—hundreds of rougher, tougher cutting "spur" points per square inch for fastest stock removal.

And for greater endurance, greater resistance to grinding heat, and longer life, it provides the strongest resin bond ever attained for abrasive belts and discs.

Feel the difference . . . see the difference . . . profit by the difference. Just mail the coupon to arrange a demonstration of new "81-Coat" belts or discs on your toughest job . . . to spur more production, more mileage per belt—*at no increase in price!*

# BEHR-MANNING CO.

TROY, N. Y.

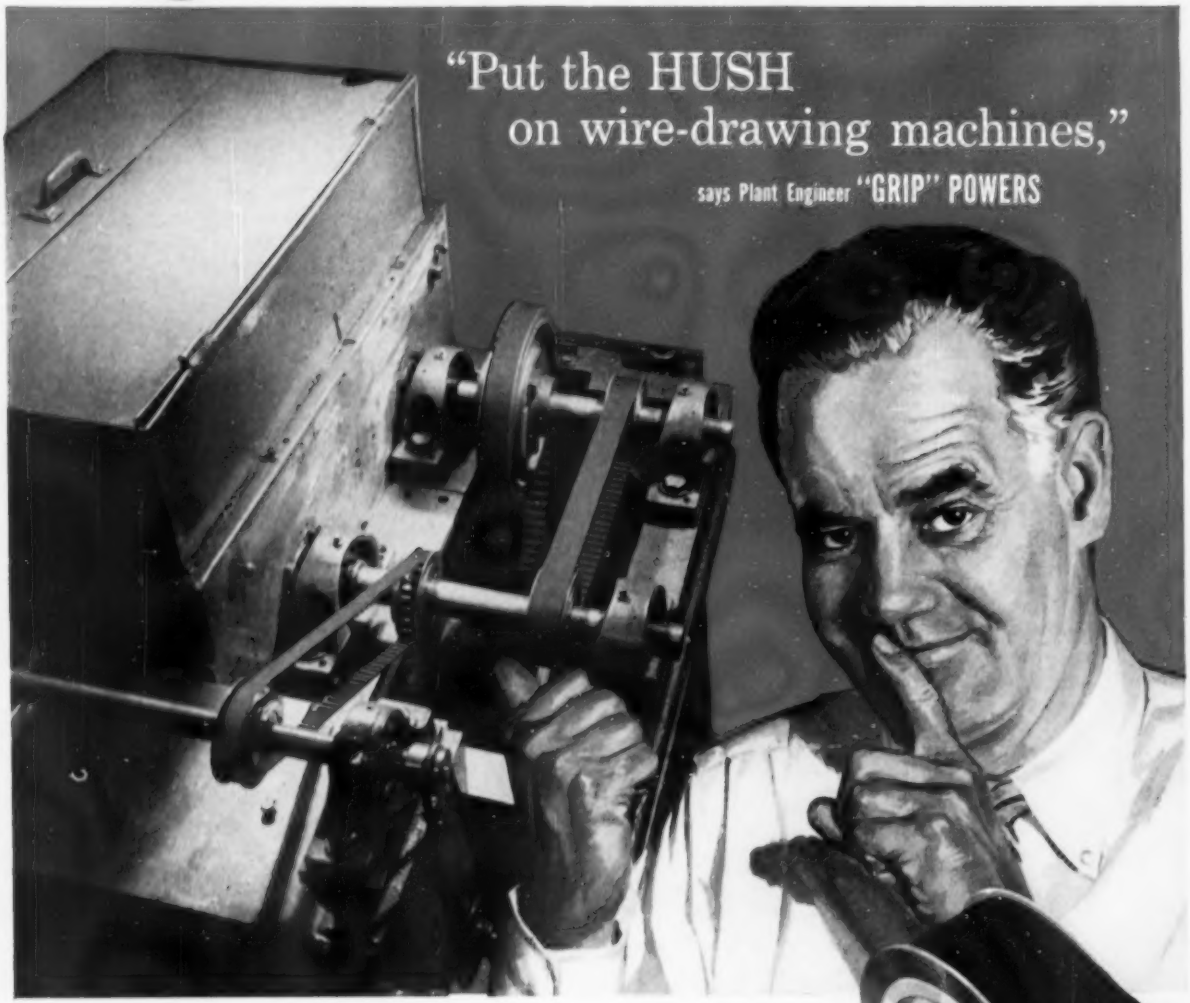
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NORTON ABRASIVES

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US RUBBER **PowerGrip** "TIMING" BELTS




Wire-drawing machines in a large Indiana factory work 24 hours a day, 7 days a week ...drawing 1,650 feet of wire per minute. The chain drives on these machines caused a deafening noise.

A deafening noise, until a "U. S." power transmission engineer suggested a change-over to PowerGrip "Timing"® Belts. Comparative quiet now prevails: there is no more nerve-racking, unmerciful din. Workers now enjoy radio music throughout the plant. Moreover, cost savings resulted; the belts required no maintenance, whereas the metal belts required taking up twice a year and replacement once a year. The PowerGrip "Timing" Belts have been operating for well over a year, yet there's no sign of wear, no foreseeable need for replacement.

U.S. PowerGrip "Timing" Belts have an efficiency of close to 100%, because they have a positive, non-slip grip. They handle speeds up to 16,000 f.p.m., or so slow as to be imperceptible to the eye. These belts, plus on-the-spot engineering counsel from industrially-famed "U. S." power transmission experts are available at any of the 28 "U.S." District Sales Offices, or from selected distributors, or write us at Rockefeller Center, New York 20, N. Y. In Canada: Dominion Rubber Co., Ltd.

US RUBBER **Mechanical Goods Division**

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Complete line stocked by
the Standard Tool Distributor in your area



These are the things you look for in the Reaming of Holes.

"Standard" quality Reamers will give you all of them.

Select your Reamers from the "Standard" *Complete Family* of rotary metal cutting tools.

*Quality Tools Since 1881*

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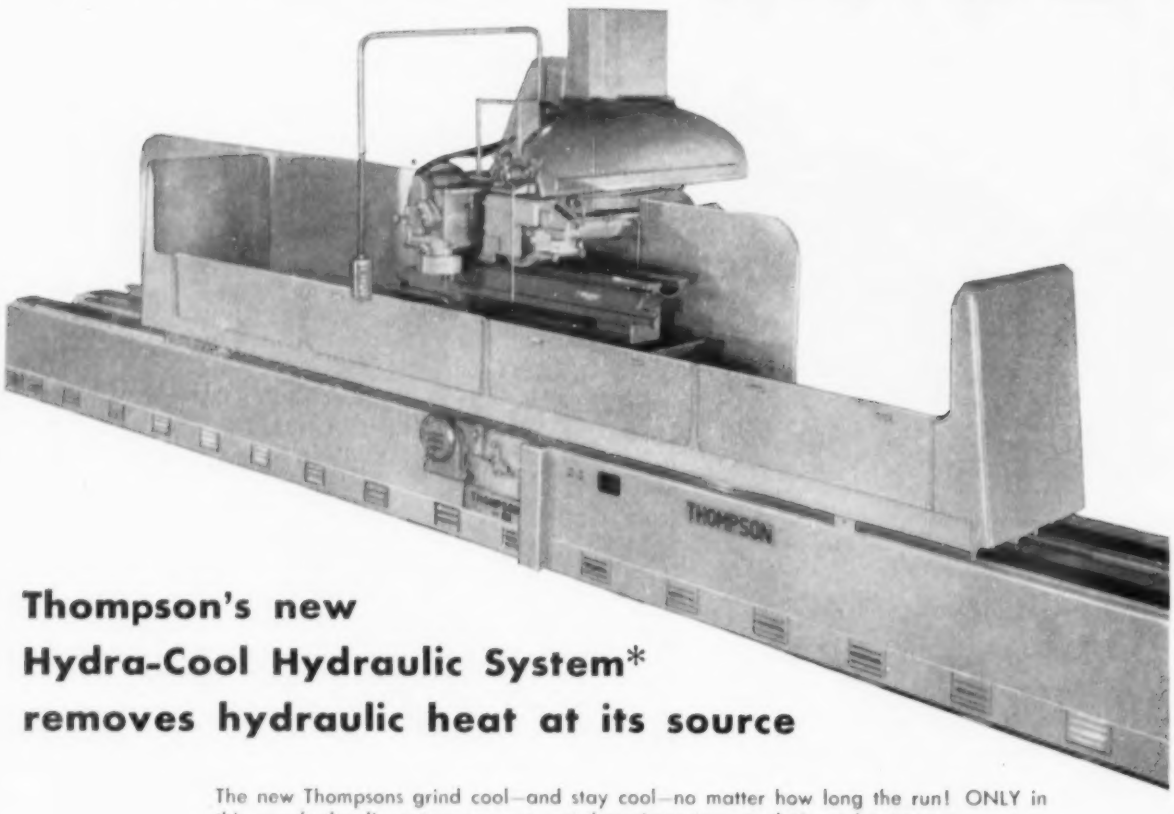
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# HYDRA-COOL




## Thompson's new Hydra-Cool Hydraulic System* removes hydraulic heat at its source

The new Thompsons grind cool—and stay cool—no matter how long the run! ONLY in this new hydraulic system can you get these important, exclusive advantages—

- Hydra-Cool eliminates heat damage to the hydraulic seals, valves, controls and pump.
- Hydra-Cool will not break down the additive-type hydraulic oils—sludge will not form in the Hydra-Cool System.
- Hydra-Cool eliminates the usual lengthy warm-up period required to bring production surface grinders up to working temperature.
- Hydra-Cool saves you money on power costs.

Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.

*Pat. Applied For

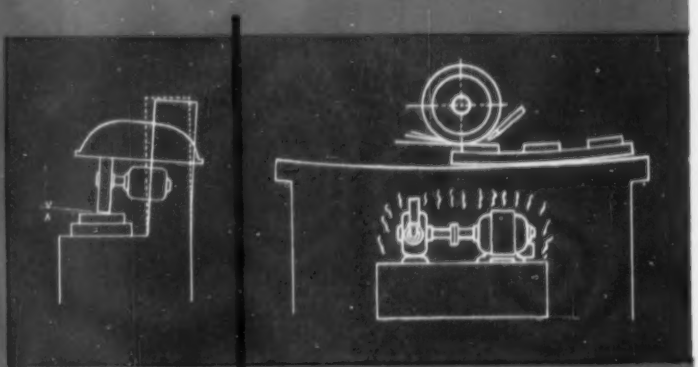
"KEEP Thompson IN MIND FOR THAT DAILY GRIND"

*Constant*

# ASSURES ACCURACY

## HEAT DISTORTION IS ELIMINATED IN THOMPSON SURFACE GRINDERS

As shown at right, heat distorts the column of a surface grinder from its true vertical alignment, causing the column to bend back from the work table. This further destroys the machine's accuracy.



*HOW HEAT DISTORTS A SURFACE GRINDER*



Coolant, splashing and evaporating on the work table, cools the top surface, which contracts. Hydraulic heat, ranging from 50° to 70° above ambient temperatures, heats the bottom surface of the table, which expands. This causes the whole table to become concave. As shown in the exaggerated drawing above, any work being ground during this distortion is ground too heavily on the ends of the table and not enough in the middle. Surface flatness and parallelism cannot be maintained.

***No more than a 3° rise above ambient temperature is ever found in the Hydra-Cool System! Distortion is eliminated—accuracy is assured.***

***SEND FOR DESCRIPTIVE HYDRA-COOL FOLDER***

**The Thompson Grinder Co.**
18 Zeischler Street
Springfield, Ohio, U. S. A.

Thompson
SURFACE
GRINDERS

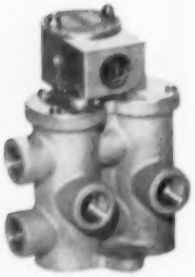


FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-281

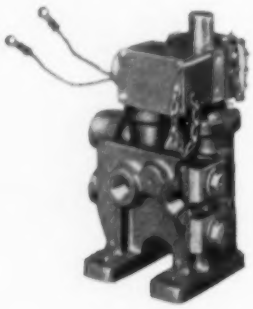
Crescent® Solenoid Valves give

**LONGER SERVICE for LESS MONEY**

We invite your on-the-job comparison



Standard 4-Way



J.I.C. Type 4-Way



Standard 3-Way

® 4-Way and 3-Way Solenoid operated, pilot controlled valves for Air, Water and light oil to 150 P.S.I., products of Crescent Valve Co.

**NO COIL BURNOUT**

because a generous power margin, short solenoid travel and pilot operation combine to prevent overheating and overloading. Note that these valves are accepted and used in automotive plants where assembly line production does not permit coil or valve failure.

**LONG SERVICE LIFE**

Main valve design is aimed at extremely long trouble free service. Resilient seats are tight sealing and are not affected or damaged by dirt or grit because they are of a self scavenging design. Witness their superior performance in such severe service as operating hopper doors on cement batching equipment and in other dusty environment.

**INTERCHANGEABILITY**

Solenoids and pilot sections are interchangeable from one valve size to another, minimizing spare parts requirements. Adaptation to any practical voltage is achieved by a simple coil change.

Speed of response, speed of installation and dependable leakproof operation year in and year out are responsible for the increasing switch to Crescent valves on production machinery where time is money.

For complete data write for Catalog 6-C.

**BARKSDALE VALVES**

5125 Alcoa Avenue, Los Angeles 58, California

USE READER SERVICE CARD; INDICATE A-9-282-1

**Faster SET-UPS!**



Types to fit any machine used for tapping or reaming.

In tapping and reaming, the Ziegler Holder greatly reduces set-up time because it automatically compensates for inaccuracies in spindle alignment up to 1/32" radius or 1/16" diameter.

It also aids materially in reducing spoilage losses, turning out work to the finest of tolerances even when the work is not in perfect alignment with the spindle.

The Ziegler Holder always floats freely, without friction or cramping, even under the severest tool-driving strains, taking any and all end-thrusts. Try it and see how much superior it is to any holder that you have ever used.

PROMPT DELIVERY

**W. M. ZIEGLER TOOL COMPANY**

13574 AUBURN DETROIT 23, MICH.

Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

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In Steel . . . Stainless . . . Brass . . .
Aluminum . . . Titanium . . . and Wood

**HI-STANDARD Deep-Hole Drills give you . . . at lower cost . . .**

- Exacting Hole Diameters
- Unlimited Hole Depth
- Exceptional Hole Concentricity Throughout
- Improved Hole Surface Finish
- More Pieces Between Grinds




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**THE HIGH STANDARD MANUFACTURING CORPORATION**

Hamden, Connecticut

Pioneers and Makers of Deep-Hole Drills For More Than 30 Years

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**New Model D Single Dial CompAIRator.** Available with instrument mounted gaging; or for remote connection to machining operations for in-process or post-process gaging.

# New!



**New Model E.** For the first time, a low-cost version of standard Taft-Peirce circuits so you can cut costs by using air gaging for many more inspection operations. Has external tolerance hands and compact cabinet. Same accuracy, same dependability — the biggest air gage value on the market.

## HIGH PERFORMANCE Air Gage Line

### ...the TAFT-PEIRCE Model D CompAIRator

Here's another big improvement in air gaging. The well-known CompAIRator has a completely new functional design that gives you 3 big advantages: — makes air gaging easier to read, easier to use and easier to trust!

*EASY TO READ* — Special visor and slanted face cuts glare and reduces parallax — speeds the gaging operation. Dial has full 180° linearity.

*EASY TO SET UP AND USE* — Zero and range setting knobs are within easy reach of the operator. Plus, compact chassis, and simplified dial and magnification changes. The Model D can be set and used at any angle, moved easily because it's light. Can be racked or modulized.

*EASY TO TRUST* — Yes, you can place full confidence in the new design because it uses the proven T-P Velocity-Venturi Circuit. Repeats readings without variation, has exceptional speed of response and is readily adaptable to many special uses, including wide tolerance gaging.

Modernize your gaging with this new CompAIRator. Or, ask a Taft-Peirce representative to demonstrate the new T-P CompAIRator — you'll be amazed at the performance.

## TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO., WOONSOCKET, R. I.

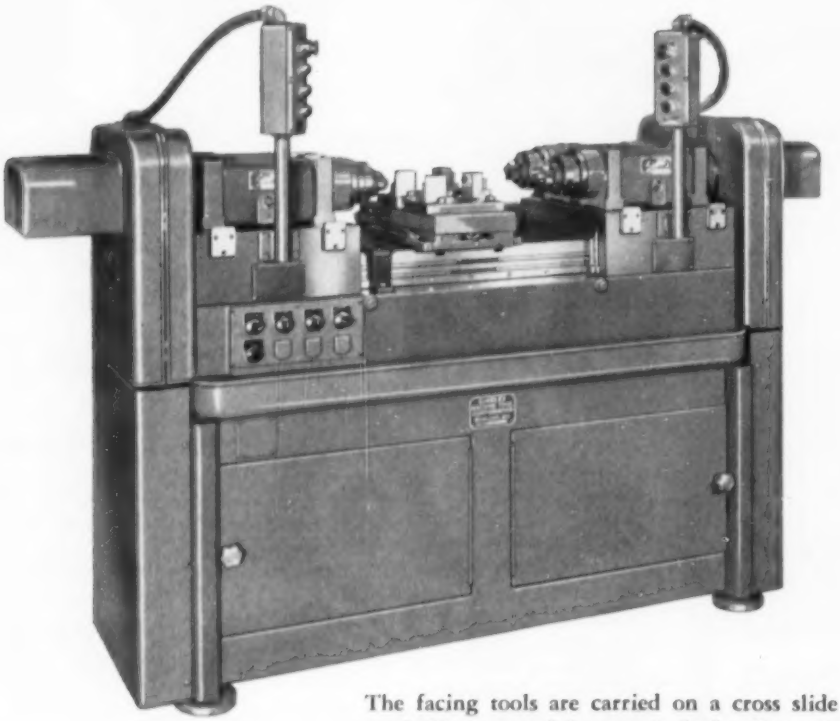
T-P Means TOP Precision

25TH YEAR
1932 – 1957

Simplex

# BUILDING PRECISION BORING MACHINES

SIMPLEX 2BDA double end, bridge type, mechanical automatic cycling unit for facing one side of an automobile pump rotor. The operation performed consists of facing one side square with the pitch line of the internal gear. The side faced is used as a locator for subsequent surface grinding operations.



The facing tools are carried on a cross slide which is automatically operated by an air hydraulic cylinder. This cross slide is mounted on the standard machine table which shuttles longitudinally to provide loading clearance.

**SIMPLEX MACHINE TOOL CORPORATION**

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MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES
SPECIAL DRILLING, TAPPING AND BORING MACHINES



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# How The Answer To Our Own Problem Has Helped Other Manufacturers SAVE MONEY WITH PRODUCTION LAPPING



One section of our production lapping department showing a battery of Model 48" Lapmasters® turning out a part of the high volume required every day in the precision lapping of all John Crane Mechanical Seals.

A few years ago, we had to find a faster and *better* way to produce flatness and finish on mating parts in order to keep up with the constantly growing demand for John Crane® Mechanical Seals.

Lapping was the only way of meeting our rigid quality specifications... but available lapping equipment could not *consistently* turn out acceptable work at the production rates demanded. With necessity, the mother of invention, we developed the Lapmaster® and solved a serious problem.

## HERE'S WHY hundreds of manufacturers have since discovered the time and money saving advantages of production lapping with the Lapmaster:

- The Lapmaster eliminates production bottlenecks frequently caused by old lapping methods.
- You can depend upon flatness within tolerances of .0000116" or less with absolute uniformity, piece after piece.
- No downtime for truing lap plate... conditioning rings automatically keep plate flat and true.
- Product performance and quality improved... rejects cut to minimum... inspection costs reduced.
- Operator need not be experienced in the art of lapping.
- Frequently eliminates other machining operations.
- Handles large or small parts... any shape or form ... any metal, ceramics or plastic materials.

### HOW TO PROVE TO YOURSELF

**That the Lapmaster Can Save You Money, Too**



Send us samples and surface flatness and finish specifications of parts... we'll test run them in our experimental lapping laboratory and furnish you with a complete production report without obligation. Or write for FREE Booklets with complete facts on producing and measuring precision flatness and finish.

Crane Packing Company, 6469 Oakton St., Morton Grove, Ill. (Chicago Suburb)
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John Crane



MECHANICAL PACKINGS



SHAFT SEALS



TEFLON PRODUCTS



LAPPING MACHINES



THREAD COMPOUNDS

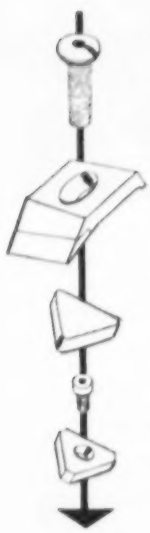
**CRANE PACKING COMPANY**

# 2 Firth Sterling MECHANICAL TOOLHOLDERS

**for the most economical Tooling combination *you've ever used!***

With these two Firthite Mechanical Toolholders and Firthite Carbide throw away Inserts you can handle almost any turning, facing and chamfering operation at lower tool cost and with less downtime for tool maintenance and resetting. *Mechanidex* for heavy duty, high production jobs; *Thriftool* for lighter ones. Use these two and save time and money!

## FIRTHITE MECHANIDEX



- Mechanidex toolholders feature one-piece adjustable chipbreaker clamp, eliminating loose parts when indexing.
- Carbide tipped or high speed steel chipbreaker clamps optional.
- Clamp screw nut eliminates heat-seized clamp screws, permitting easier insert indexing and replacement.
- Available in 4 styles Right or Left hand in shank sizes ranging from ¾" sq. to 1¼" sq. (Can use complete line of standard throw away inserts.)
- Negative rake design permits use of triangular and square inserts with 6 or 8 cutting edges, depending on toolholder style.

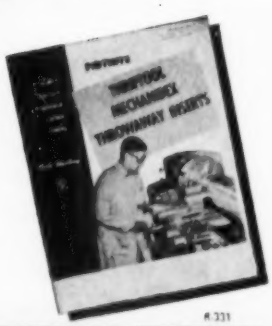



## FIRTHITE THRIFTOOL



- Triangular throw away inserts with 6 cutting edges . . . no grinding, use each cutting edge once then throw away.
- Outlasts single point brazed tools.
- Lowest cost mechanical toolholder; fewest component parts. (Chipbreakers optional.)
- Toolholder parts interchangeable — reduces inventory and handling costs.
- Precision anvil assures proper insert positioning. (¾" square shanks and above.)




*Write to:*

200 Firth Sterling Building, 3113 Forbes St., Pittsburgh 30, Pa. for your free copy of Catalog MTI-3, "The Modern Approach to Economical Carbide Tooling."

**Firth Sterling**

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

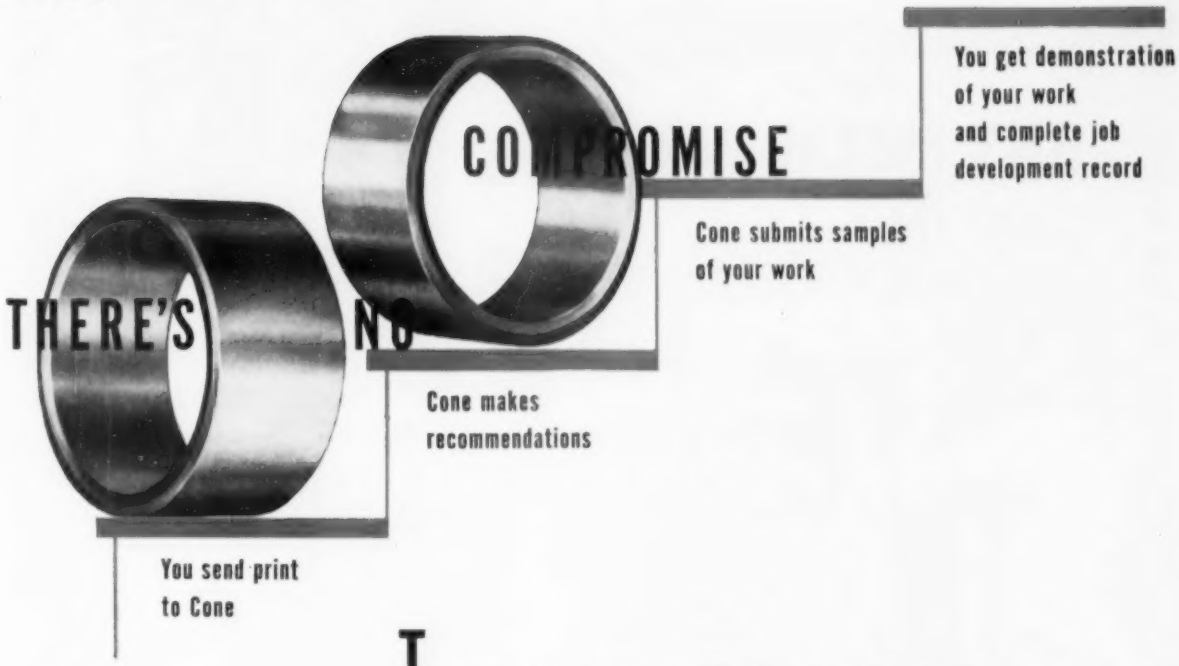
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**PRODUCTS OF FIRTH STERLING METALLURGY**

High Speed Steels
Tool and Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

No. 6 in a series




There is no adequate compromise with efficient production practices, if you are in business for a profit.

But you don't always know just how competitively efficient your equipment is. Case histories of what the other fellow is doing are sometimes garbled. At least the poor ones are not advertised. And conditions vary in all plants. Sometimes you have reason to be more concerned with what you don't want in new equipment than with what you do want. Cone believes too much is at stake for a machine to go into a line unequipped for the job, with either carbide or hss tools.

The Conomatic Carbide Development treats each job individually from standpoint of work, machine, tools, and operating personnel.

DATA FOR COMPARISON

| | | | |
|---|---|---|---|
| Part | Bushing | Length | ⅝" |
| Machine | 1⅜" Conomatic | Hole Dia. | 1¼" |
| Tools | 100% Carbide Tipped | RPM | 825 |
| Material | 8620 | Time | 14.8 Secs. |
| Stock Size | 1⅜" | | |



# Conomatic

*For particulars send for "Four Steps With Cone"*

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-287

Hold mill-like tolerances of ± .005" on

# ANY METAL . . .

## DAY IN, DAY OUT!



**STONE**

**MODEL M-100**

**Chop-Stroke Cut-Off Machine gives fast, accurate, fully automatic cutting**

Cuts any stock . . . in a wide range of shapes, lengths and diameters . . . any material, from aluminum to hardened tool steel. The M-100 will cut it swiftly, cleanly, accurately. Set-ups or resets are easily made. The M-100 cuts at a rate of 2 to 4 seconds per sq. in. cross sectional area . . . up to 5 times faster than comparable power cutting. Exclusive Stone geared-in-head motor delivers maximum power to the cutting edge. Greater speed of cutting produces no change of characteristics nor hardening of material cut.

The M-100 is powered by a 10 H.P. continuous duty, TEFC ball bearing induction type motor. Cuts ferrous metals with an abrasive wheel . . . nonferrous metals with a saw blade. It comes with fully automatic stock feed and automatic abrasive wheel wear compensator for faster, more accurate cutting without shut-down for adjustment.

The M-100 may be had for manual or semi-automatic operation. For greater power needs, a 15 H.P. motor is available.

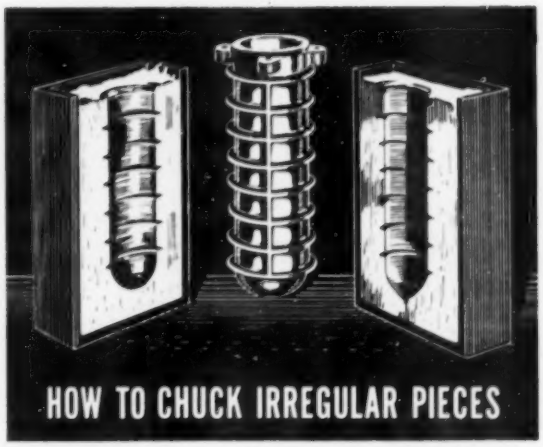
WRITE TODAY for complete information on the MODEL M-100, and other cut-off machines by Stone. Fifteen models available in 3½ to 20 h.p. manual, semi or fully automatic operation. Sales and service in principal cities.

*". . . represented in every major industry throughout the world."*

**STONE MACHINERY COMPANY, INC.**

**31 Fayette Street, Manlius, New York**

USE READER SERVICE CARD; INDICATE A-9-288-1



# HOW TO CHUCK IRREGULAR PIECES

## *quickly and inexpensively*

It's easy to make chuck jaws for irregular workpieces with Cerromatrix®, the low-temperature melting alloy. Just cast it against the workpiece and you get an accurately fitting pair of jaws. The alloy can be cast against forged metal parts, die castings, rubber, wood and most plastics without burning or warping the piece.

**Send for Bulletin B5—it tells the whole story.**

**Send for further information.**

**CERRO DE PASCO SALES CORPORATION**

300 Park Avenue, Room 1503, New York 22, N. Y.

USE READER SERVICE CARD; INDICATE A-9-288-2



# VAILL

**TUBE END-FORMING MACHINES**

**shape and form tube ends fast...accurate...at less cost**

**FREE—New Bulletin T-1 shows, describes VAILL tube end forming machine VERSATILITY for . . .**

**Beading • Flaring • Flanging • Sinking**

**Expanding • Grooving • Threading • Reducing**

**Double Lap Flaring • Double Lap Flanging**

**on Tubing up to 6"Diam.**

**THE VAILL ENGINEERING CO.**

**131 E. MAIN STREET WATERBURY 20, CONN.**

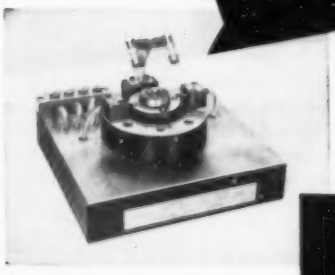
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# Speed Inspection
## OF PRODUCTION PARTS!



NEW **DEARBORNAIRE**

### MULTIPLE COLUMN AIR GAGING INSTRUMENTS





**Special Air Gaging Fixtures** designed and built to meet your particular application requirements. Complete engineering service available upon request.



Send part print showing all dimensions to be checked and tolerances required for prompt quotation and delivery.



To speed inspection of production parts, new Dearbornaire air gaging instruments are now offered in multiple column units designed to permit more accurate simultaneous checking of as many dimensions as may be required for a given part. What's more, each unit incorporates all of the advanced design features which have made Dearbornaire the most practical, most versatile column type instrument ever produced . . .

- New higher rated pressure system and built-in circuit restrictions make them virtually self-cleaning, reduce maintenance to a minimum.
- New glass tube has a characterized internal taper which provides positive linear accuracy over the full extent of the calibrated scales.
- Easy-to-read Zero-centered scales permit use of instrument for normal inspection, statistical quality control, and as a tool setting gage.
- Interchangeability of component parts simplifies conversion from one amplification to another, reduces spare parts inventory costs.

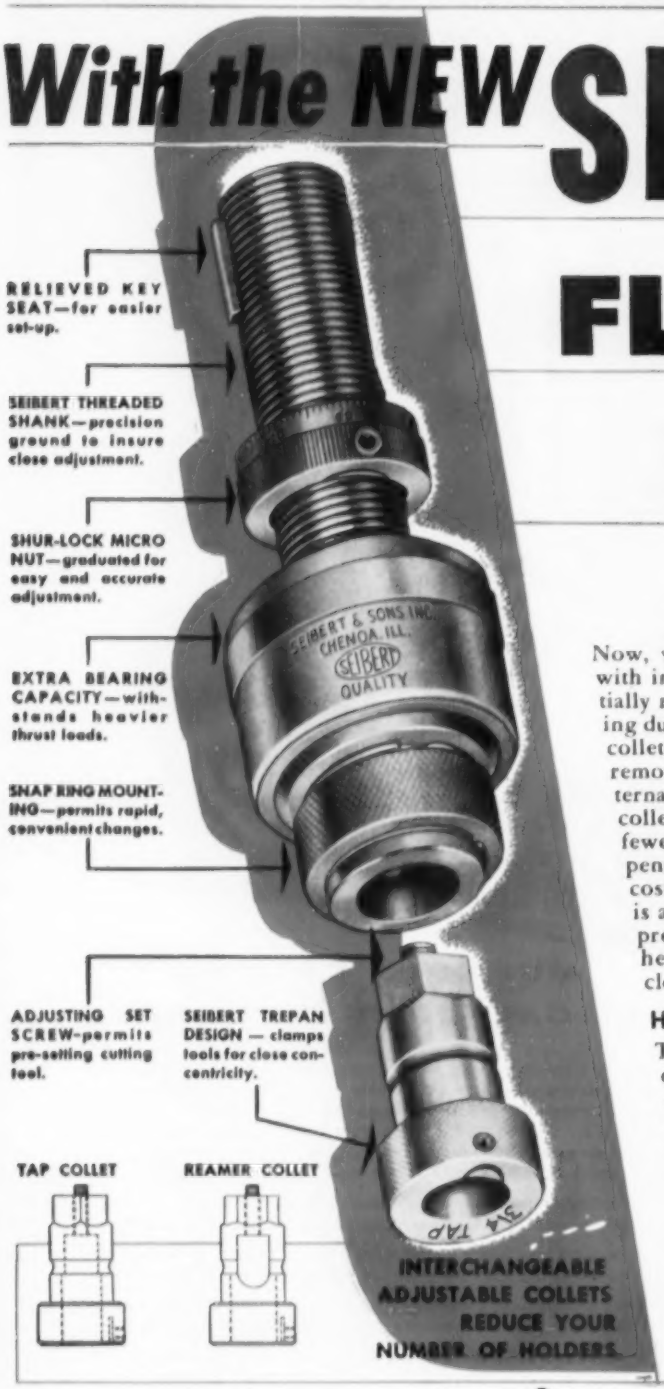
Plus a complete line of air gage spindles, rings, snaps and cartridges all precision finished to give you greater accuracy, longer wear life. Free demonstration arranged upon request. Write for details today!

**AIR GAGE DIVISION**
**DEARBORN GAGE COMPANY**
22038 Beech Street • Dearborn, Michigan

## Convenience • Economy • Efficiency •

# With the NEW SEIBERT FLOATING HOLDER

(Patent Applied For)




### Fast Change Pre-Setting Collets Reduce Number of Holders Needed

Now, with the new Seibert Floating Holder equipped with interchangeable auxiliary collets, you can substantially reduce costs on tapping and reaming jobs requiring duplicate pre-set tooling. As illustrated, the auxiliary collet is snap-ring mounted in holder for quick and easy removal. No wrenches or drifts are required. An internal adjusting set screw permits pre-setting tools in collet without removing holders. Thus you require fewer holders per job, and because collets are inexpensive you effect substantial savings in overall tool costs. Close concentricity is maintained because tool is accurately held in collet by trepan clamp which is precision machined to close limits. Elimination of hex nut clamping principle also provides extra clearance when tapping in counter bored holes.

### Heavy Duty Holder Assures Long Service Life

The holders are heavy duty roller-type and are especially designed with extra bearing capacity to assure long service life. All shank types are available in a range of sizes including the adjustable adaptor shank illustrated. Send for full information today on these new cost cutting tools.

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Get the complete story on the new Seibert Floating Holder. Ask for illustrated specification sheet or have a Seibert Sales Engineer call at your plant to check over your tooling requirements.






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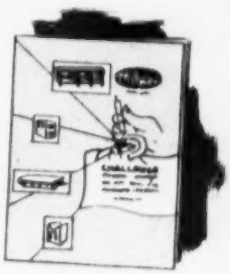
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to help you select the right equipment for each precision job. Most of the Challenge precision equipment is either carried in stock by your local Mill Supply Distributor or is otherwise readily available for prompt delivery.

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Please send Challenge Precision Catalog No. 838W

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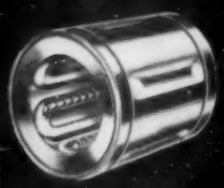
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**PROGRESSIVE MANUFACTURERS USE BALL BUSHINGS–A MAJOR IMPROVEMENT AT A MINOR COST**

## *Talking About Die Sets*



*with*

**Phil Marsilius**

*Executive Vice-President*
*The Producto Machine Co.*

**How to Select and Order a Catalog Die Set**—Do you always order the die set you *really* need for the job...or do you overlook a specification which results in your having to "make do" with the set you ordered or lose time by having to re-order?

Once again, we feel that a simple and basic practice should be emphasized because our daily experiences show that even the most painstaking individual occasionally overlooks one or more factors in preparing to place an order.

**Here is our suggested check-list** for selecting and ordering a catalog die set:

**1. Lay out the die.** Allow sufficient area for feeding devices and auxiliary stock guides that may be required. Determine also what areas must be left clear for part ejection or scrap.

**2. Determine type of set** you need—rear two-pin, four-pin, center-pin, etc.—according to tolerances and construction of die.

**3. Place layout on templates** for the type of die set you have chosen. Select die area that best meets the limits established in Step 1.

**4. Select material** for die set—semi-steel, all-steel or combination—based on the die's strength requirements.

**5. Select thicknesses** of punch and die holder in line with strength requirements and allowable press shut height.

**6. Determine length of guide-pin required*,** based on length of stroke or ram clearance.

**7. Determine type and length of bushing** and material from which it should be made, based on accuracy, speed of operation and required life expectancy of die.

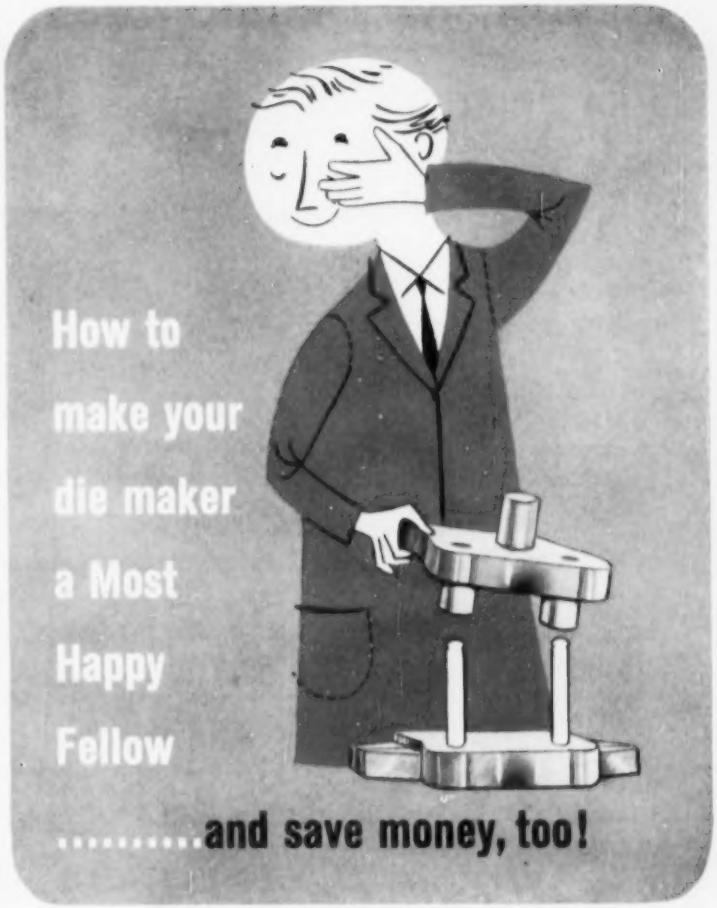
**8. Select shank diameter** for the press on which die will be run.

**9. Choose grade of precision** required—Master or Commercial—based on tolerances and number of pieces to be produced.

**10. Order die set** which meets most closely the above requirements, making certain that *all* ordering information is included: Catalog number and quantity; Master (Precision) or Commercial grade; length of guide pin; type of bushing; diameter of shank or "no shank"; how to ship. Keep in mind that special thicknesses of punch holder and die holder can also be ordered if required.

Of course, you may not find it possible to check these points in the exact sequence presented. However, if you will make it a habit to use this check-list for each die set you need, you can avoid making costly errors in ordering.

*"L" dimensions pertaining to pin length as shown in die set catalogs refer to distance from bottom of die holder to top of pins. They do not necessarily apply to actual guide pin lengths.




It's easy. Just be sure to specify Producto die sets with *Qwik-Fit guide pins.*

Then your die maker will always be able to assemble and disassemble his die sets practically blindfolded! No longer will he have to line up pins and bushings cautiously...tediously hammer die sets together...or pry them apart. With Qwik-Fit guide pins, the die set almost *puts itself together.* The spherical-angular radius on these pins prevents jamming or cocking *regardless of how the punch holder is started on.*

Think of the time your die maker will save...and the money *you* will save. Dies are growing more complex daily and that means assembly and disassembly of the die set dozens of times. In plants all over the country, Producto's Qwik-Fit pins are saving up to 75% of the time formerly required for these operations.

To improve morale and increase productivity, join the growing ranks of die manufacturers and users who specify "Producto die sets with Qwik-Fit guide pins." They are available on Master die sets at no extra cost.

**HOW TO MAKE ORDERING EASIER:**

Get your free copy of Producto's Die Set Catalog No. 11, designed specifically to simplify your selection and ordering job. And ask to receive the idea-filled Die Set Digest, too.



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930 Housatonic Avenue, Bridgeport 1, Connecticut

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*ACCURACY*
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Eliminates expensive tool construction – Reduces tool wear – Prevents seizure and pilot breakage – Especially adapted where precision is required.

ORIGINATORS OF THE ROTARY BUSHING
**GATCO ROTARY BUSHING CO.**




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Stops Losses making Dies and Templates




Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

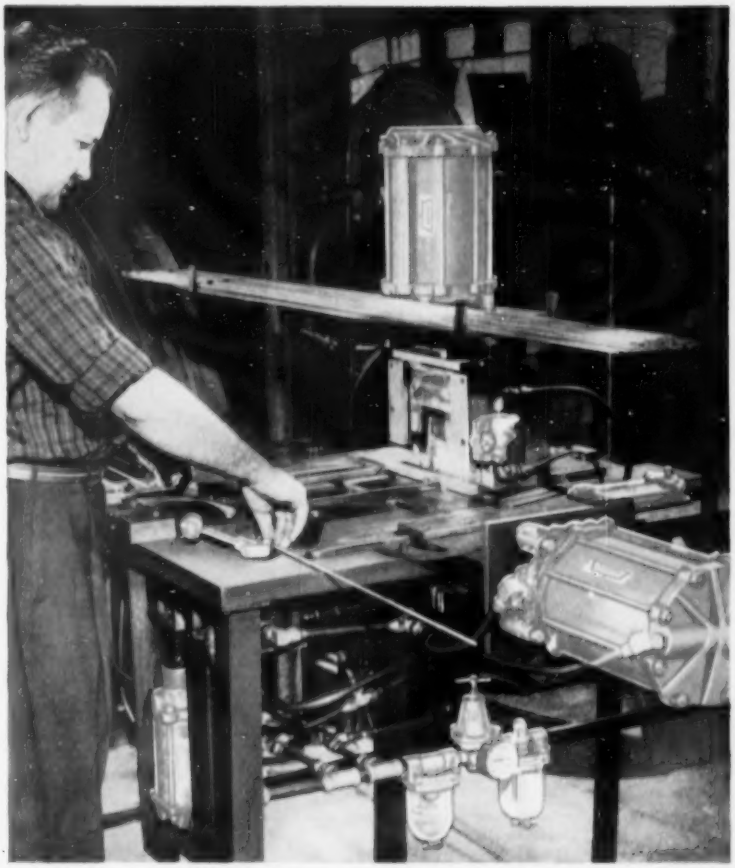
*Write for sample on company letterhead*

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***Progress** in plan-it-yourself air systems:*

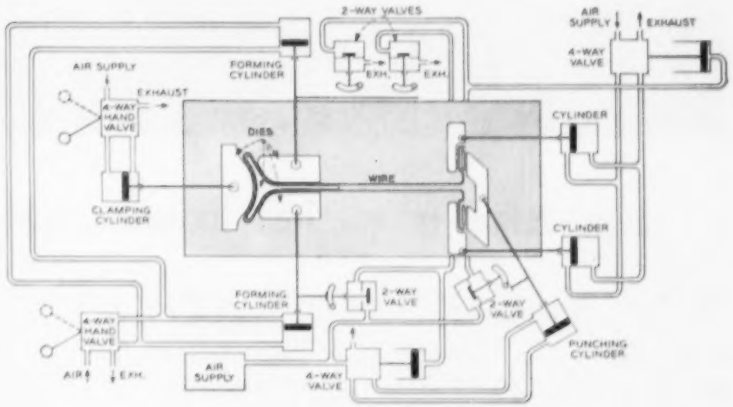
# How one plant cuts forming costs 75% with Schrader Air Products adapted to jig



Outdoor grill legs formed. Operator places wire between dies. Note Schrader products. Schematic below gives Schrader "Air layout" at end of cycle with wire formed.

Before this Schrader-powered forming jig was installed, an Ohio plant used heavy punch press equipment and costly welding procedures. Now man-hours and materials have been released for other work, and a single operator produces the finished part in seconds, effortlessly. Cutting the cost of the finished product by ¾!!

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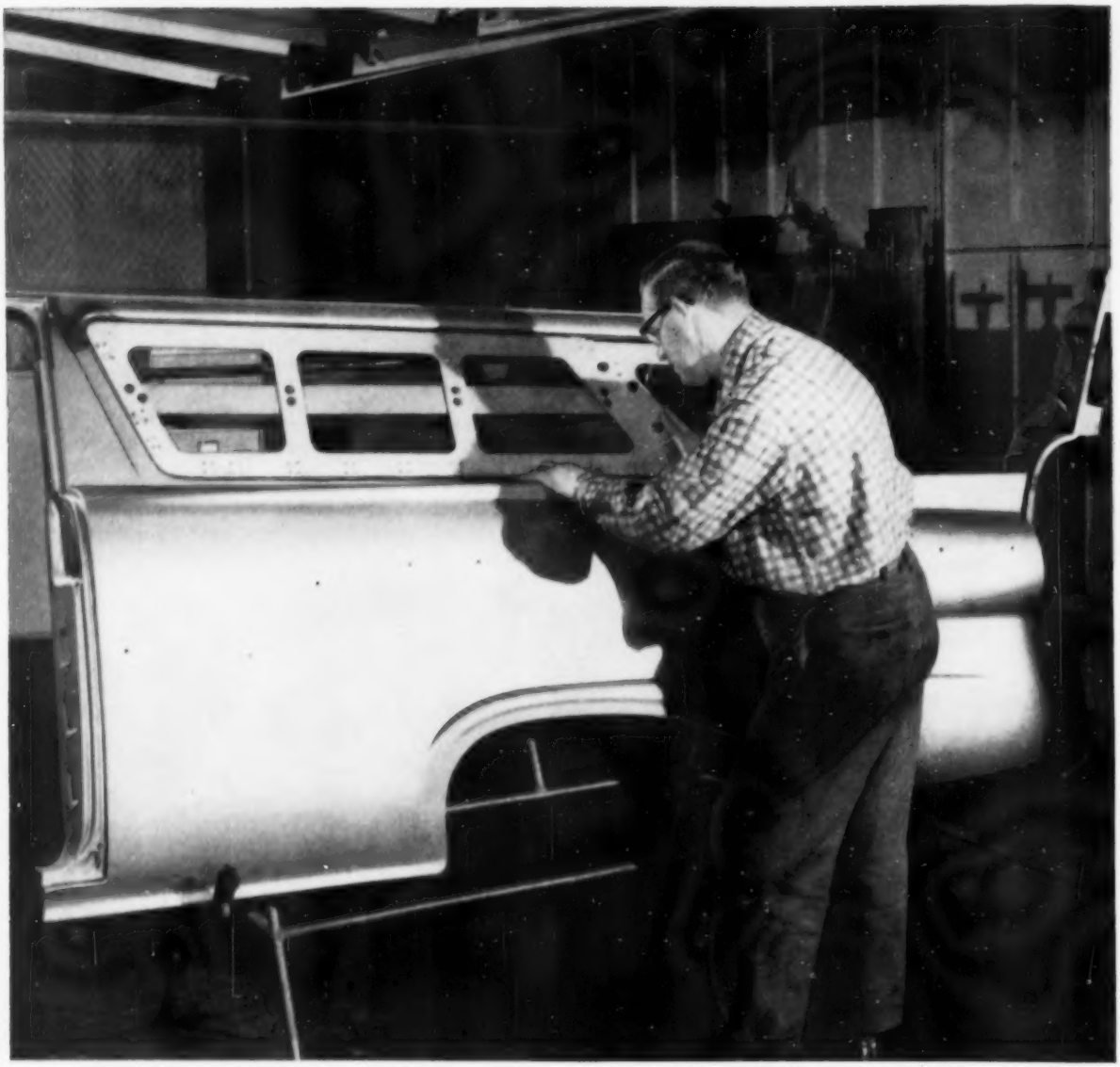
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Please send latest informative booklets which show Schrader's complete line of products.

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# Lightweight magnesium fixture checks Ford station wagons

This magnesium checking fixture is used by Ford Motor Company in assembling Ford two-door station wagons.

It helps to maintain quality by checking the daylight opening relationship to the glass run channel and regulator retainer brackets in the quarter panel welded assembly. It assures accurate location of the glass run retainers and window regulator mounting holes. The fixture is dimensionally stable and has stood up well under continuous rough handling. One man can easily lift and manipulate it with one hand.

Jigs and fixtures made with magnesium are always easy to handle because they weigh much less than steel or aluminum. Magnesium tooling plate is uniformly flat, low in cost and easy to machine, fabricate and weld.

For the full story on magnesium tooling plate contact your nearest supplier of Dow magnesium or write to us.

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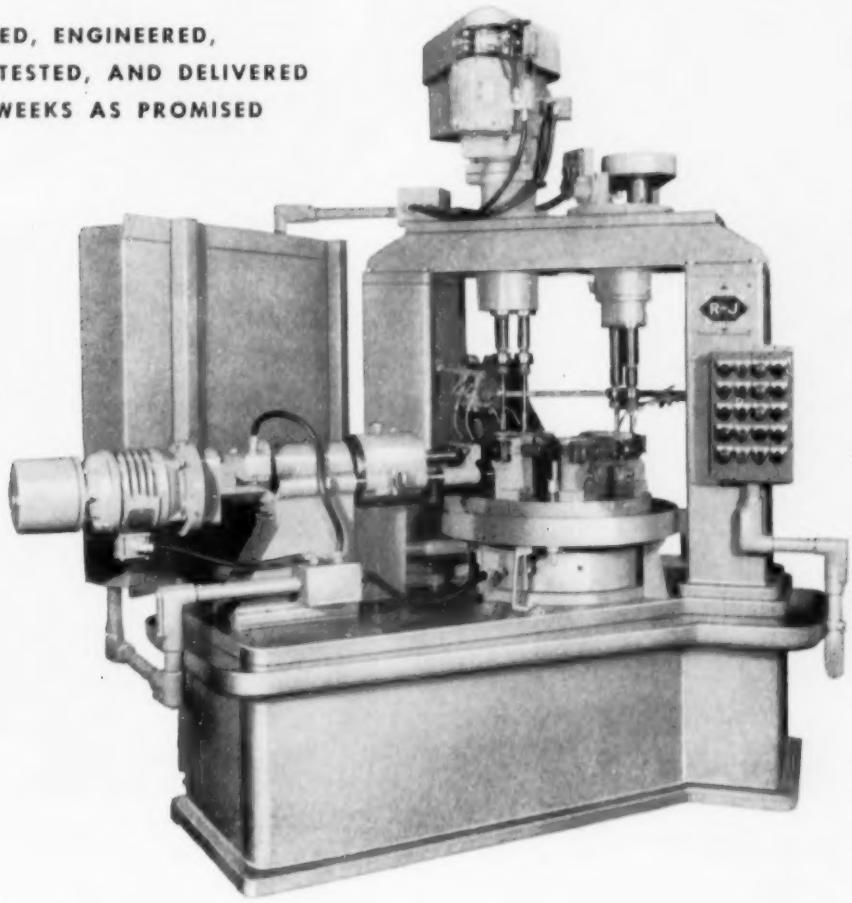
YOU CAN DEPEND ON DOW

This is a 4-station automatic-index machine which drills, reams, and rethreads a steel brake part. Each fixture holds two pieces. Cycle is timed for 544 pieces per hour.

**MACHINE NO. 1230**

# REHNBERG-JACOBSON

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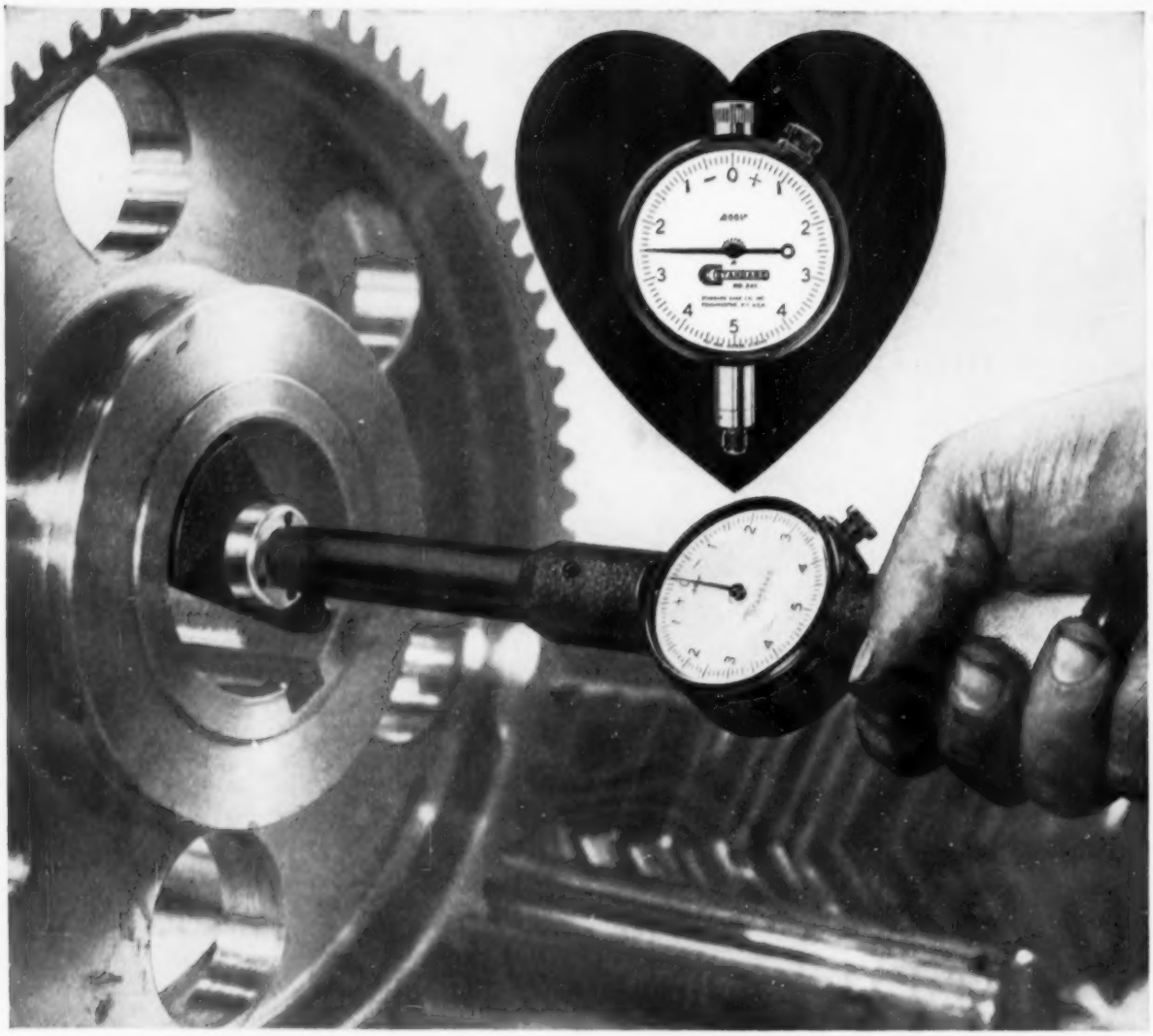


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**DESIGNING ENGINEERS, MANUFACTURERS, AND PRODUCTION CONSULTANTS**



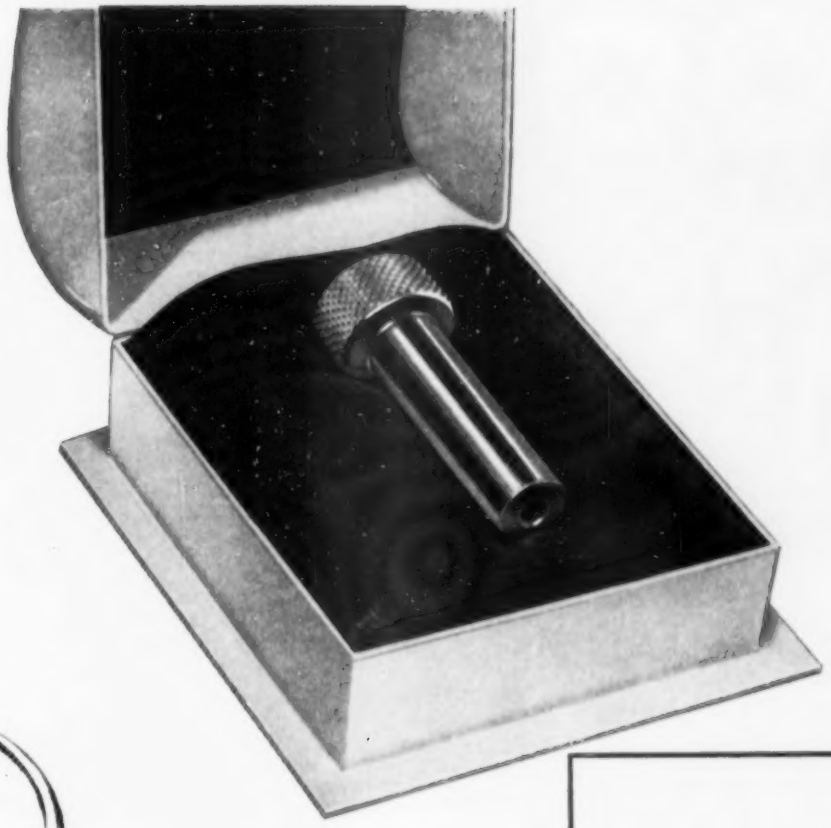

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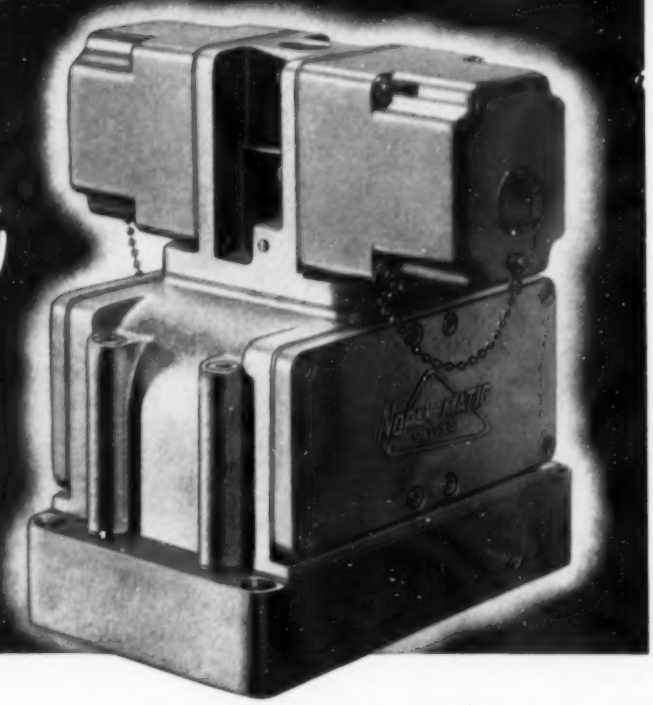
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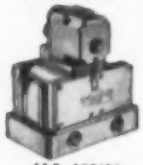
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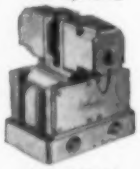
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MICRO-FOG lubrication automatically coats all the bearings, gears, chains and other components of a machine with a continuous, protective film of clean oil. Just the right amount of oil is applied to provide the most efficient lubrication, reducing wear on machine components, and cutting maintenance and replacements costs.

### 2. Oil Always Fresh, Always Clean



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### 3. For Large and Small, Plain and Anti-Friction Bearings

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A single, MICRO-FOG Lubricator will automatically deliver enough airborne lubricant, proportionately distributed to completely lubricate even a large machine tool. Only one lubricator to maintain and refill.

### 5. Big Savings in Lubricant

Carefully metered quantities of oil are applied to each lubrication point. MICRO-FOG provides more thorough lubrication using only a few ounces of oil per day than other methods using several gallons of oil per day.




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Air passing through the bearing carries away heat, and there is no pool of lubricant in the bearing to generate heat as a result of fluid friction. Lubrication is continuous — there are no periods of insufficient lubrication with metal wearing on metal.

### *For Lubricating*

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- CHAINS
- SLIDES
- WAYS
- OTHER MACHINE COMPONENTS

### 7. Contaminants Excluded From Bearings

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### 12. A MICRO-FOG Lubricator For Every Size Machine

19 models to choose from—ratings up to 1,000 bearing inches and oil reservoir capacities up to 4½ gallons.

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Mohawk TOOLS, Inc.

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# The COST of a drill bushing depends on

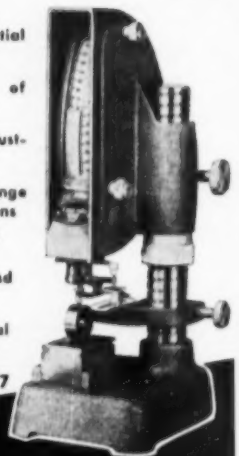



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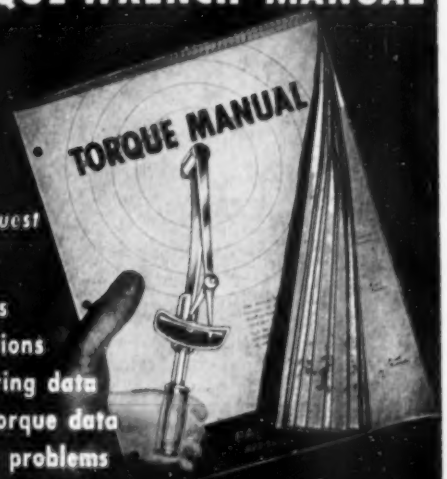
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**"TORQUE WRENCH" MANUAL**




*Sent upon request*

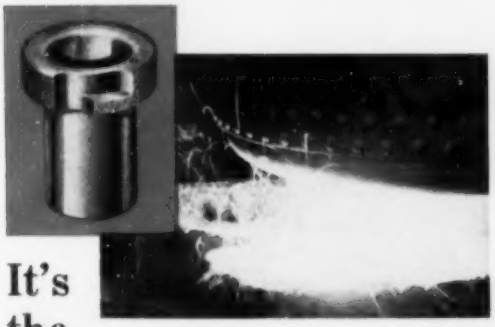
Formulas
Applications
Engineering data
Screw torque data
Adapter problems
General principles

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS
Manufacturers of over 85% of the torque wrenches used in industry

USE READER SERVICE CARD; INDICATE A-9-304-2

# its working LIFE!



## It's the *steel* in ACE drill bushings... *that makes the difference!*

When working life is doubled . . . bushing costs are cut in half! Fewer bushing changeovers add *bonus production savings!* That's why ACE drill bushings of new high-carbon chromium steel are being *specified exclusively* by cost-conscious tool men everywhere! Make a *working comparison* NOW with any other make bushing . . . and see "Positive Proof" that *the steel makes the difference!*

*Write for the all new 1957 ACE Catalog G-3 and the name of your nearest distributor.*

ACE DRILL BUSHINGS

ACE DRILL BUSHING CO., INC.
5407 FOUNTAIN AVE., LOS ANGELES, CALIF.
ACE DRILL BUSHING CO. INC.
611 McCARTER HWY., NEWARK 5, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-305-1

## Holds 1800 Blue Prints



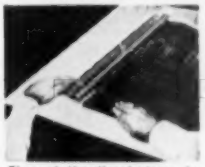
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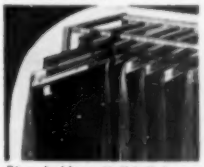
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Through the direct clamp design of plan holders, you slip sheets, either singles or sets, in or out without removing others.



Plan holders "glide" in on steel tracks, are secured from end-to-end, and "glide" out with little effort.

Created for savings in filing space, time and effort, Gliders are available for print widths of 20" to 48". Gliders obsolete peg-type filing and hole-punching.

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new ELASTICONE® guide pin covers CUT DIE COSTS 25%

reduce lubrication
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increase press time
preserve alignment

Discover how inexpensive ELASTICONES can provide increased production, lower die costs by closing the gaps between pins and bushings, reducing die breakage and maintenance. Just snaps into place — no installation or maintenance costs! Bulletin 53 contains complete information. Send for it today!



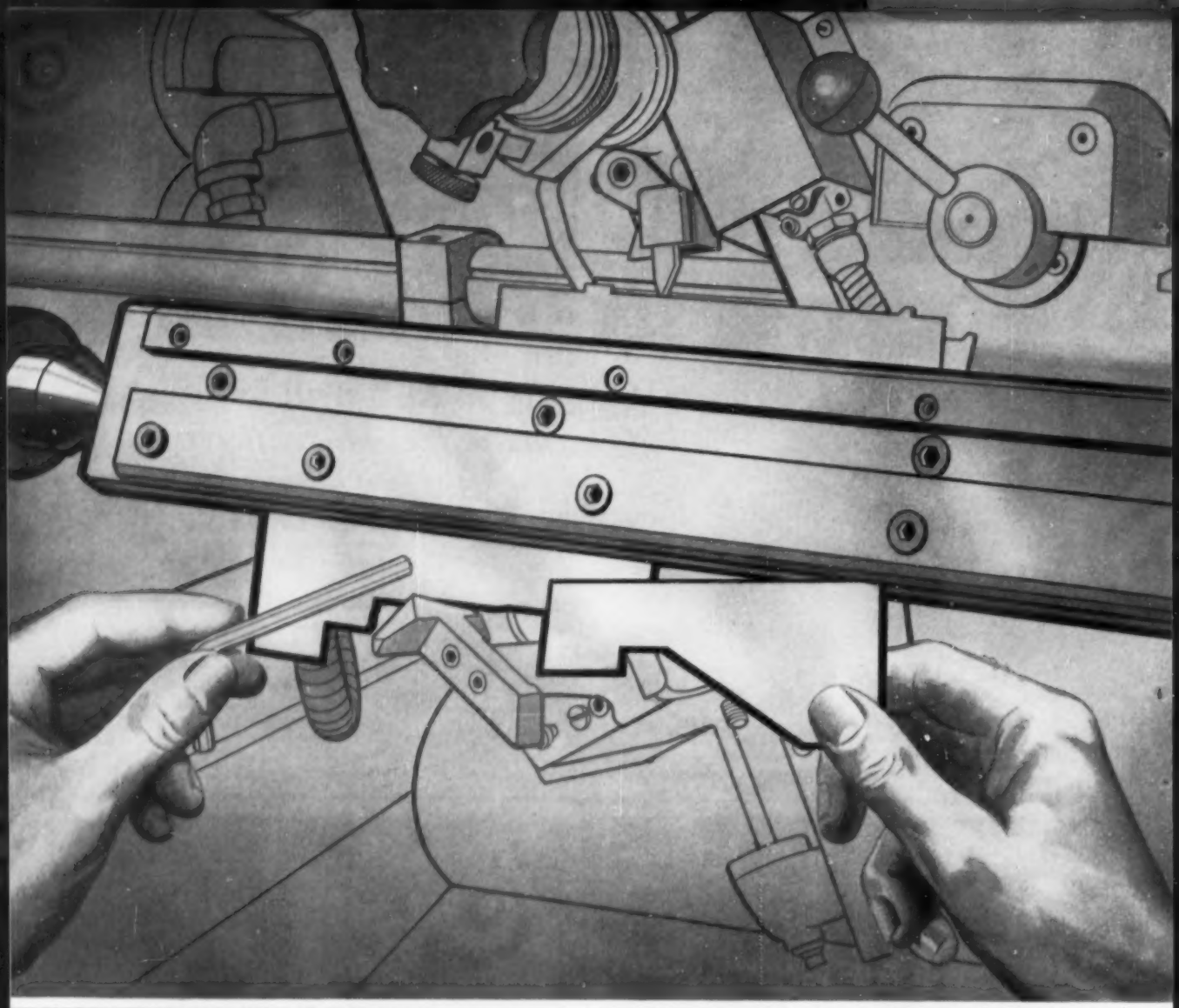
CENTRAL Safety Equipment Co.

6615 MARSDEN ST. PHILADELPHIA 35, PA.

For complete information on Elasticones and a copy of Bulletin 53 use convenient coupon.

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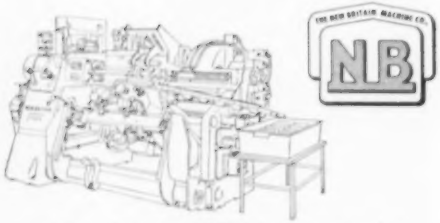
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# template control "locks in your dimensions"

# on New Britain +GF+ copying lathes

When you fasten the template on a New Britain +GF+ you lock in every dimension of the piece. The complex settings necessary in gang tooling setups simply don't exist. You change the tool in the time it takes to loosen one set screw. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.




New Britain +GF+ Copying Lathe

# OUTSTANDING PERFORMANCE




## SCREW MACHINE TOOLS

**by**
**Boyar-Schultz**

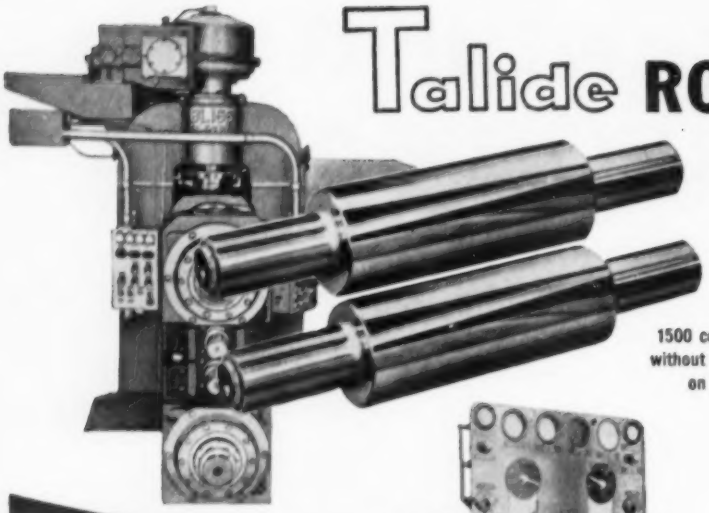
They are engineered to bring out ALL the production that is built into your screw machines. Easy and fast to set-up, they provide close tolerance accuracy through long production runs with "down-time" at a minimum.

**BOYAR-SCHULTZ** CORPORATION
2004 South 25th Avenue, Dept. SMT-A, Broadview, Ill.

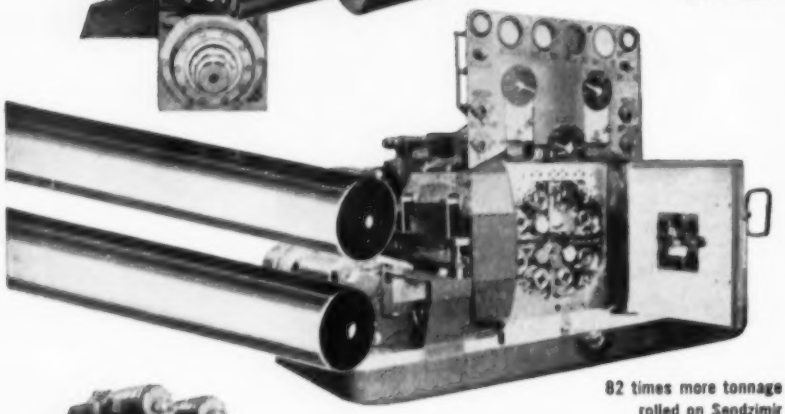
See your nearest distributor. Phone him or write us for our information packed catalog. . . . It's FREE.



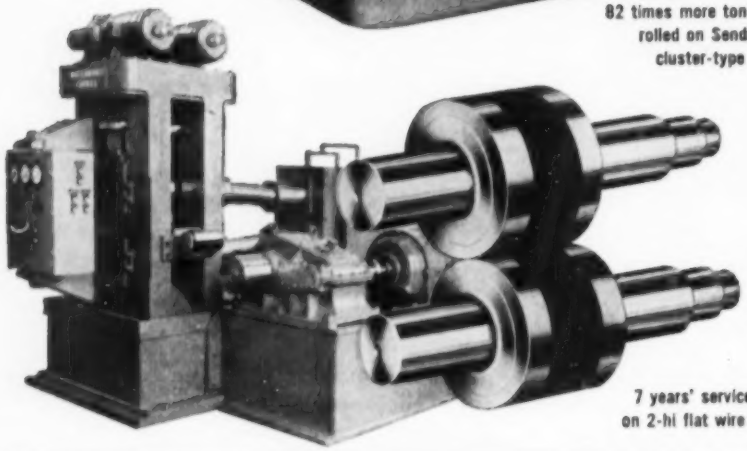
# Talide ROLLS OUTLAST ALL OTHERS!



1500 coils rolled without a regrind on 4-hi mill.



82 times more tonnage rolled on Sendzimir cluster-type mill.



7 years' service life on 2-hi flat wire mill.

Talide rolls have proven far superior to both steel rolls and carbide rolls of any other make.

During the last five years Talide rolls have been adopted by every major strip steel producer. Metal Carbides pioneered and developed tungsten carbide rolls and successfully adapted them to all types of rolling mills including STECKEL, BLISS, UNITED, MESTA, STANAT, SENDZIMIR, WATERBURY-FARREL, TORRINGTON, RUESCH, FENN, WEAN, COLD METAL, etc.

Talide work rolls are ultra-hard, extremely dense and porous-free. Manufactured from highest purity tungsten carbide powders, the surface finish of a Talide roll is smoother than one microinch. Hard as a diamond, it will take a "bigger bite" than a steel roll. Strip steel of all analyses can be rolled down to thinner gauge, with more accuracy, greater reductions and with fewer anneals than possible with any other roll.

## ONLY TALIDE WORK ROLLS GUARANTEE THESE ADVANTAGES

- ★ MORE PRODUCTION
- ★ BETTER FINISH
- ★ LONGER LIFE
- ★ HIGHER SPEEDS
- ★ CLOSER TOLERANCE
- ★ IMPROVED PHYSICALS
- ★ GREATER REDUCTION
- ★ LESS DOWN TIME
- ★ FEWER REJECTS
- ★ LESS MAINTENANCE

## EXCLUSIVE REPAIR SERVICE




Broken or damaged carbide rolls can be re-worked to first class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

**Talide Rolls are made in lengths up to 100", diameters up to 25", and up to 5000 lbs. by weight.**

Metal Carbides Corporation,
Youngstown 12, Ohio.

**Send for new 76-page catalog 56-G**

## SUPERSET GRINDING WHEEL

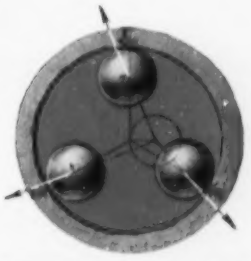


The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter




CINCINNATI

Diameters and adjacent radii and shoulders are precision ground in one operation on this CINCINNATI FILMATIC 10"R x 18" Angular Wheel Slide Grinder. Sizes available: 6"R and 10"L x 18" or 30" between centers; 10"R and 14"L x 18" to 72" between centers.



**Automatic grinding wheel balancing,** an exclusive CINCINNATI feature, balances the wheel and mount within a few seconds.

# It Pays to Combine Precision Grinding Operations

## Especially on a CINCINNATI Built for the Job

Time, effort and dollars are saved when operations are combined. And quite often quality improves, just as it does when diameters and adjacent radii and shoulders are ground in one operation on CINCINNATI® FILMATIC Angular Wheel Slide Grinding Machines. These fine precision grinders are built for high production work at the lowest cost of any equipment available today. Many features contribute to this outstanding performance.

**Push-button automatic grinding cycle,** incorporating coarse and fine feed rates.

**Roll-out cutting fluid tank.** Cuts down service attention.

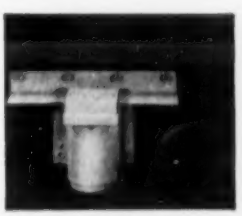
***Automatic air-electric gage sizing** with cycle time stabilizer. High degree of accuracy and compensation for wheel wear obtained automatically.

***Automatic gap eliminator.** A timesaver where stock allowance varies widely.

***Behind-the-wheel profile truing equipment,** for automatic, accurate profile truing in both directions.

Additional features and their advantages are illustrated and described in catalog No. G-686. Write for a copy. Brief specifications in Sweet's.

**Available at extra cost.*

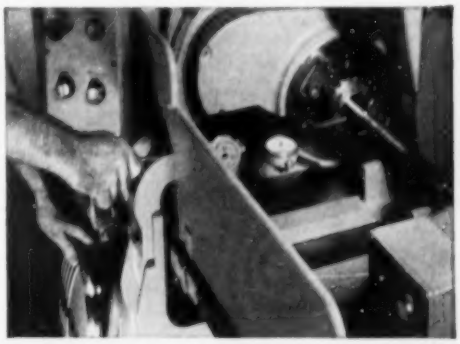


**Automatic hydraulic table clamp** automatically locks the machine table in position during the grinding cycle.

**CINCINNATI GRINDERS INCORPORATED • CINCINNATI 9, OHIO**

# CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CRUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

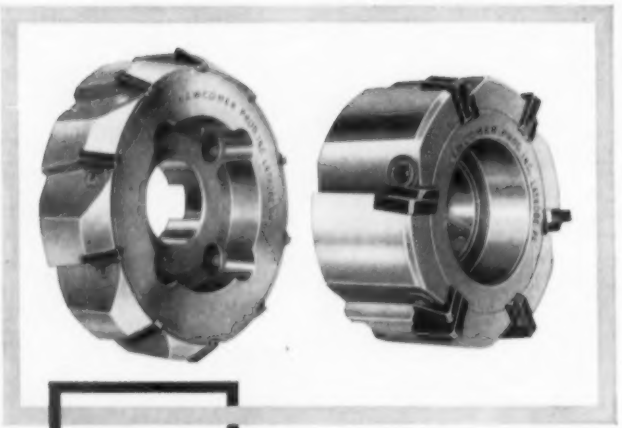


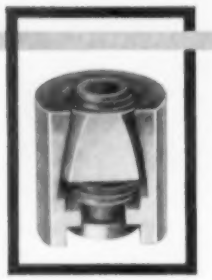
**Manual flagging device,** for locating the work axially with respect to the wheels, is simple and accurate. Automatic flagging device is also available.



# Setting a new pace in high speed milling

# Newcomer RC Milling Cutters and NP "Throway" Carbide Blades





## New "C"-LOCK facilitates indexing . . .

In one operation after another, Newcomer RC Milling Cutters are setting a new standard for high speed milling . . . a standard that has enthusiastic users reporting increased production at a new low cost!

These new two-piece cutter bodies with distinctive features combine with NP "Throway" carbide blades to permit heavier feeds and faster speeds . . . eliminate grinding time and costs . . . drastically cut machine downtime . . . and minimize cutter inventories. One cutter body can mill both steel and cast iron by simple use of proper NP carbide grade.

"C"-Lock rigidly holds blade against flat ground seating surface of cutter body. This lock provides quick access to change and indexing of cutter blades with nothing more than a hex wrench. Blade won't move or "work out" during tightening. Indexing is positive . . . accurate!

*Contact your local Newcomer representative . . .*

Newcomer RC Milling Cutters are available in triangle blade styles for heavy and general purpose milling; or in square blade styles for general purpose and shoulder type milling.

**NEWCOMER PRODUCTS, INC.**

LATROBE, PA.

Telephone: KEystone 7-5531

GENERAL SALES OFFICE: 512 Franklin Ave., Pittsburgh 21, Pa. Telephone: CHurchill 1-4060

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"For VERSATILITY
FLEXIBILITY
and ACCURACY
you can't beat a . . .

BULLARD

"H.B.M."
MODEL 75

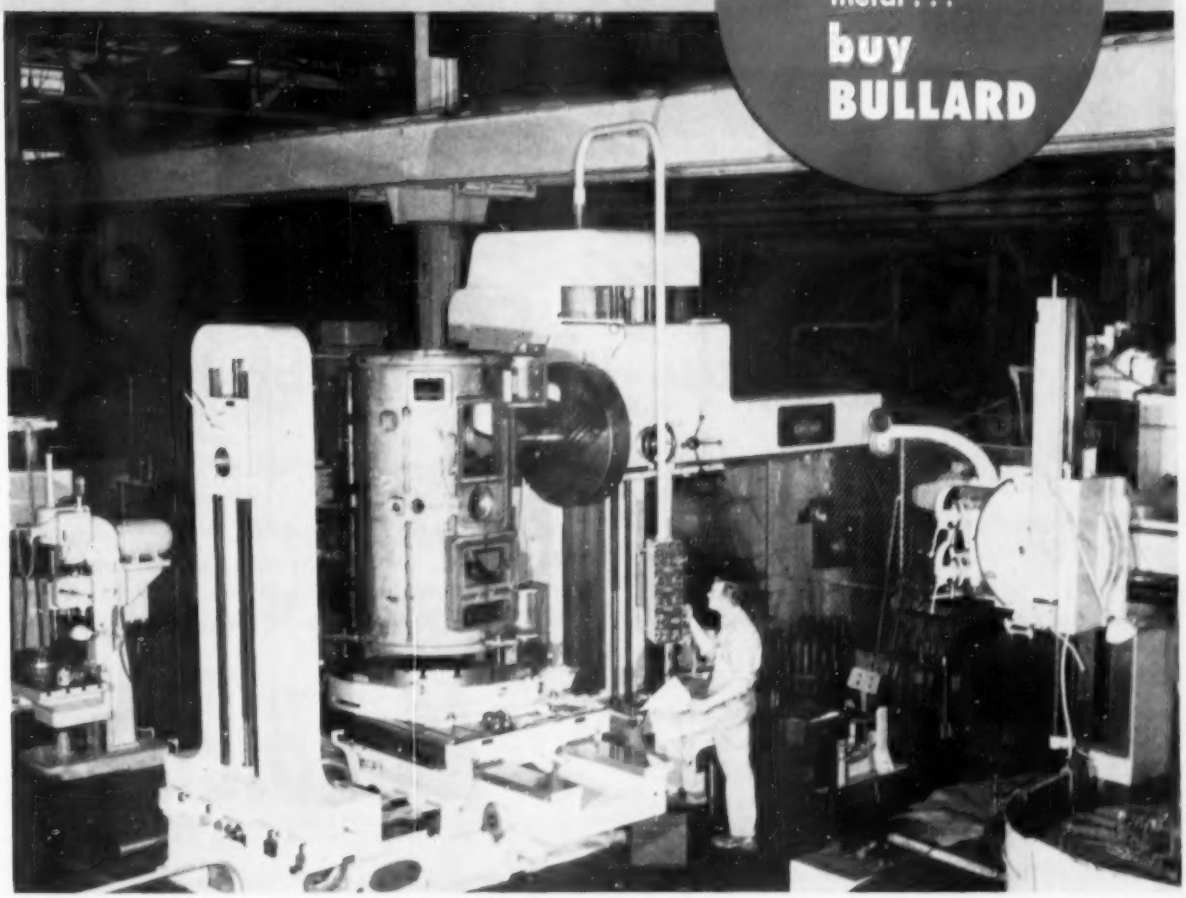
This statement, by the Planning Engineer of a Midwestern manufacturer of Diesel locomotives, sums up their experience with a 5" Bullard H.B.M., Model 75 after months of use.

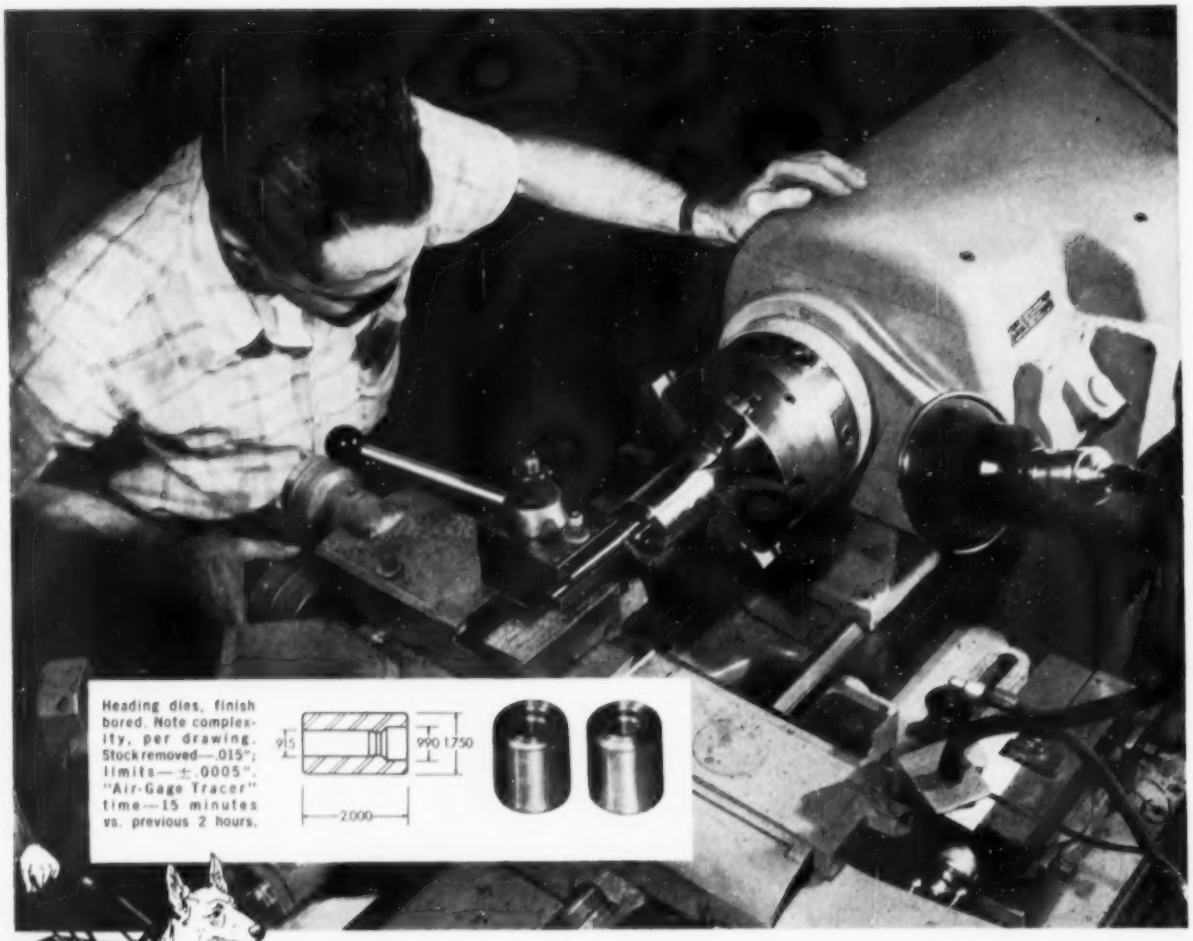
The operations successfully performed include facing, drilling, tapping, reaming and boring on a wide variety of jobs.

A Bullard Sales Engineer will be glad to tell you about the many features which make the Bullard HBM, Model 75 your best buy — just call him.

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

*Remember —*
to cut costs
when cutting
metal . . .
**buy
BULLARD**








# "Seeing-Eye Tool"

## for close-limit blind boring

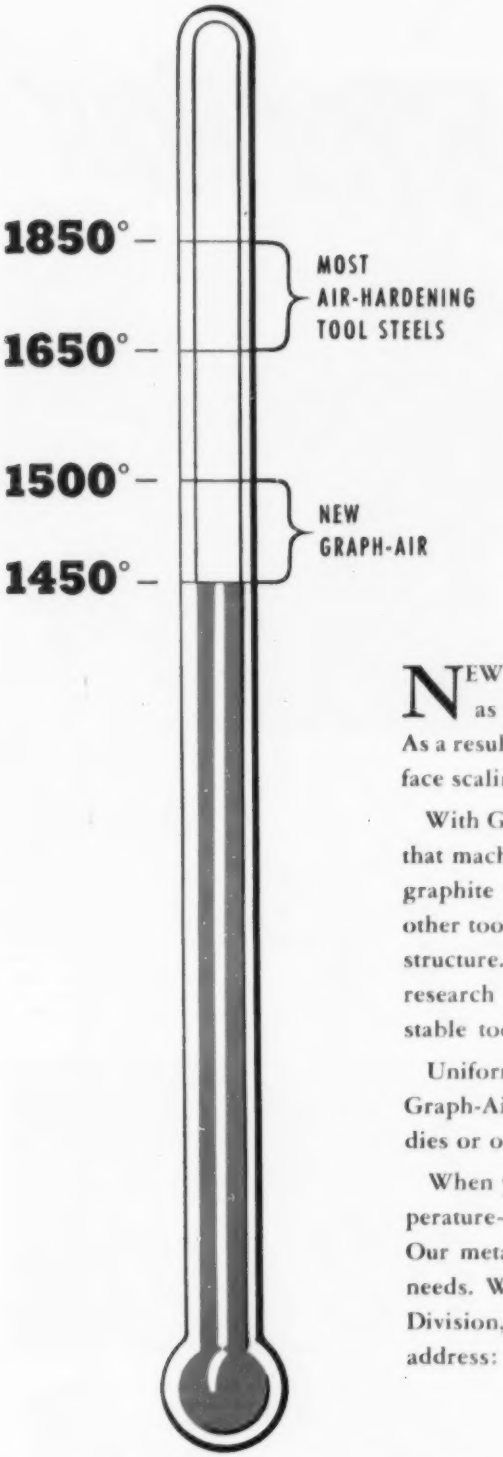
Want to take the guesswork out of close-limit blind boring? And with it that unhappy combination of low production and high spoilage? How? Let the Monarch "Air-Gage Tracer" be your lathe operator's seeing-eye.

With this device you're as certain of meeting tolerances in boring as in turning or facing. Your template is precise. Your tracer stylus, operating on a pressure of only 5-6 ozs., converts changes in template contour to corresponding tool positions within a few thousandths of a second. You hold size with certainty piece after piece—the template sees to that. Up goes production anywhere from 10 to 90%, accuracy and finish are improved—all accomplished with the most accurate duplicating device yet designed.

The "Air-Gage Tracer" can be factory-applied to most Monarch lathes. Prove *your* vision by requesting full information in the form of our complete booklet No. 2608 . . . . . ***The Monarch Machine Tool Company, Sidney, Ohio.***

**Monarch**
**TURNING MACHINES**
ACCURACY • ECONOMY • LONG LIFE

FOR A BETTER TURN FASTER . . . TURN TO MONARCH




# New Graph-Air® tool steel air-hardens from as low as 1450°F., reduces distortion

NEW Graph-Air® actually air-hardens from as low as 1450°F. That's as much as 400° lower than most other air-hardening tool steels. As a result, you reduce distortion, simplify heat treating control and surface scaling and decarburization are minimized.

With Graph-Air you get a tougher, more versatile graphitic tool steel that machines faster, wears longer, holds its accuracy longer. The free graphite in its structure makes machining easier. Graph-Air outwears other tool steels because of the uniform, diamond-hard carbides in its structure. And Graph-Air stays accurate longer—the result of painstaking research by Timken Company metallurgists, developers of the most stable tool steels ever made.

Uniform hardening and reduced distortion allow you to machine Graph-Air into more intricate sections. It's your solution for blanking dies or other steel parts that must take abuse.

When you want the best tool steel that air-hardens at the lowest temperature—specify Graph-Air. It's available in solid and hollow bar sizes. Our metallurgists will be glad to recommend the right size for your needs. Write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

**TIMKEN** *Fine Alloy* **STEEL**

TRADE-MARK REG. U. S. PAT. OFF.

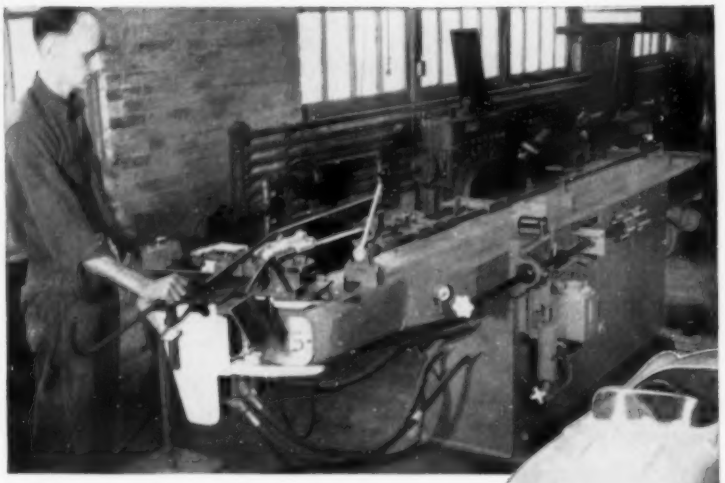
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

**See the first Timken Televent hour, in color, "Eleven against the ice—story of the Antarctica Turnpike". NBC-TV, Monday night, Sept. 23rd.**

# NET PRODUCTION

# 840 Bends Per Hour

## With PINES HYDRAULIC BENDER



### Automatic Cycling Speeds Job Work for Flexsteel Spring Division - Dubuque, Iowa

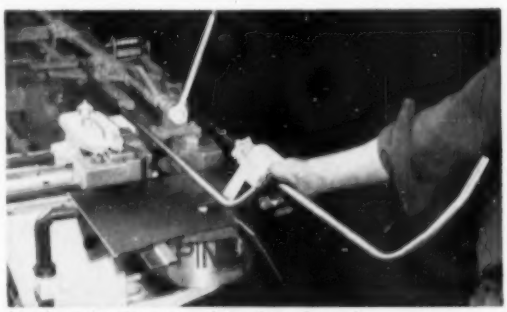
Here's another typical example of fast, efficient production bending illustrating the outstanding advantages of automatic cycling, a standard feature on most Pines machines. Flexsteel Spring Division, Northome Furniture Industries, Dubuque, Iowa, used this set-up to produce frames for a toy Corvette car from ⅝" 18-gauge welded steel tubing. Records show that over a period of three months, net production on workpiece illustrated averaged 140 pieces (840 bends) per hour. On this job requiring six bends of the same radii (1 13/16"), the operator simply positions the tubing for each bend and presses the forward button. Pre-set indexing stops automatically control the angle for each bend in sequence while the operator rapidly positions the workpiece. Automatic cycling saves valuable production time and accounts for the high efficiency rate maintained.



Over-all view of Pines Size ¾ Bender at Flexsteel Spring Division used for outside job work as well as for their own manufacturing needs. Application illustrates setup for bending long side members for toy Corvette car.

### Accuracy Maintained at High Production Speeds

Another well-known advantage of Pines machines is their ability to maintain accuracy. Tolerances of .030 to .040 at several check points are commonly held without difficulty, simplifying welding, assembly, or other fabricating operations. In addition, all Pines machines are designed for small radius bending with mandrels, as well as for bends of the type illustrated not requiring mandrels. For accuracy and efficiency, it will pay you to specify Pines.



Simple positioning gauge determines plane of each bend. View shows position for making sixth bend for right-hand frame member. Both right-hand and left-hand members are produced on same setup.



**WRITE FOR *Free* DATA SHEETS**

Ask for up-to-date case study material on production bending the "Pines-Way." Full information available, including tooling and setup data used for producing steel channels, rods, extrusions, pipe, and tubing. Or for assistance on any job, ask for a Pines sales engineer to call.

PINES ENGINEERING CO., INC.

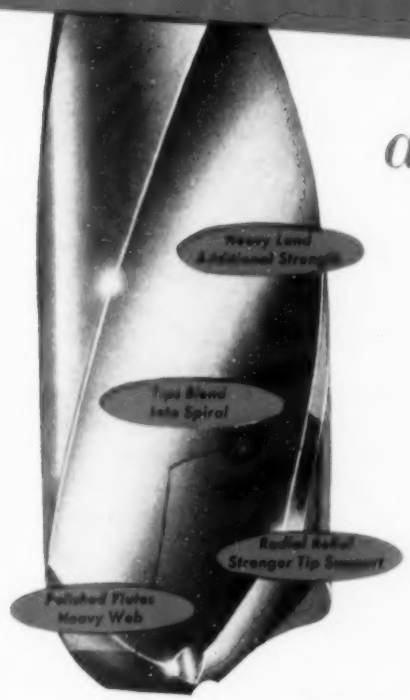
Specialists in Tube Fabricating Machinery

693 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

# here's the Super carbide drill for your job




## *any quantity .... any style*

As the biggest producer of carbide drills, we are able to offer a specific type for every carbide drilling application.

Exclusive features incorporated in these drills give greater tool life, faster cutting at lower cost.

High volume production facilities make tools available from stock.

Standards stocked in fractional, wire and letter sizes, in solid and tipped carbide; types for hardened steels, cast iron, aluminum, magnesium, plastics and abrasive substances.

*Send now for our complete 36-page catalog just off the press!*




QUALITY CARBIDE TOOLS

Super TOOL COMPANY

DEPT. 328 • 21650 HOOVER RD., DETROIT 13, MICHIGAN

WAREHOUSES: CHICAGO • DETROIT • NEW YORK • LOS ANGELES




*Any similarity to a real-life company is purely intentional*

# How did the lathe builder get the worm to turn?

Henry Wadsworth Headstock had a dream. About a better turret lathe. It used worm gears in the drives.

He not only doodled it — he dood it. And he got a venturesome soul to try out a pilot model of his new Turnabout Lathe.



Then his troubles started to multiply — like ants at a picnic. For the worm gears conked out with a sickening regularity. There were 12 replacements in 24 weeks. (Three guesses what the big wheels thought of *that!*) Things certainly were in one heck of a mesh.

Then Henry heard of Ampco Metal, the special copper-base alloy. And he had a worm gear made out of *it*. The last we heard, the Ampco Metal gear had been running for a whole year and still showed no signs of wear.



Frankly, we're not surprised. Gear service — in fact, *any* wear application — is duck soup for Ampco Metal. It resists deformation under heavy loads and speeds — so tooth contours hold their original shape. There's no scoring, no galling — the worm has true bearing action against the worm wheel. Damping characteristics, plus fine mating properties, reduce the noise of the gear set.



The moral is obvious: Why gamble with guesses on gear life (or other critical parts), when it's so easy to be *sure*.

If you want to know more about Ampco Metal, call in your Ampco field engineer. Write for Bulletin 33. *Ampco Metal, Inc., Dept. TE-9, Milwaukee 46, Wisconsin. (West Coast Plant: Burbank, California)*

**AMPCO® METAL** *The metal without an equal*

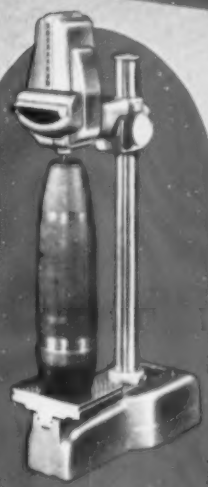
6-9

# Use a SHEFFIELD VISUAL GAGE FOR 10 DAYS ... FREE

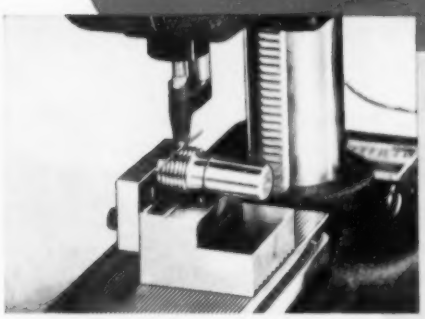




*The Visual Gage being used to check O.D.*



*The Visual Gage in the toolroom.*



*Measuring the pitch diameter of tapered threads.*



*Using the sine bar fixture to check taper.*

Prove to yourself the real value of the Visual Gage right there in your own shop. You won't be obligated in any way.

See how simple it is—how fast—how sensitive—how positive—how rugged—and how easy to read.

See how many ways you can apply it to the precision work you are doing in the toolroom and in the shop.

The Visual Gage will with suitable accessories readily check angularity and any outside dimension including screw thread characteristics.

If you are working to "Tenths", ask for a Visual Gage having an amplification of 1000 to 1. If your tolerances are as small as ten millionths, ask for an amplification of 10,000 to 1. You have a choice of 5 amplifications.

7322

the SHEFFIELD corporation

measurement for mankind

THE SHEFFIELD CORPORATION
Box 19—Dayton 1, Ohio Date

Without obligation, we'd like to try a VISUAL GAGE in our shop.

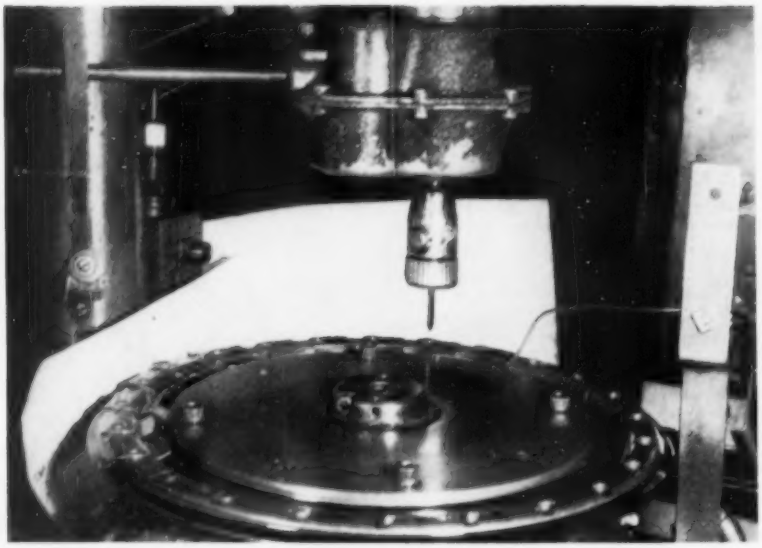
Name

Dept. Position

Company

St. Address

City Zone State



THIS AUTOMATIC MACHINE taps 2900 parts per hour with Besly 8 32 NC Spiral Pointed Machine Screw Taps. An air indexed circular feed table moves parts into position, down comes the tap, up goes the tap and on to the next piece — all automatic except placement and removal of parts.



SMALL PARTS finishing is the business of Keades, Inc. Included are "T"-nuts, bolts, rivets, clips, pins — primarily for the automotive industry. Note Besly 8 32 NC Spiral Pointed Tap right.

**BESLY 8 32 NC SPIRAL POINTED TAP . . .**

# "The Touchstone of Success"

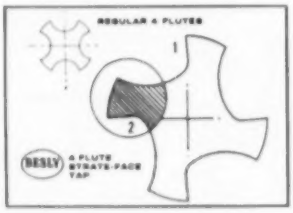
**says LEN KEAST of KEADES, Inc.**

To increase sub-contract work, Keades, Inc., Wyandotte, Mich., needed a tap to thread small parts in an automatic production machine. Since most taps available failed on the job they called on Besly's Engineering Service for a solution to the problem.

Besly Engineers designed the Besly 8 32 NC Spiral Pointed Machine Screw Tap as the answer. The spiral point on this tap causes it to cut with a shearing action which deflects chips out and ahead of itself. Chips do not accumulate thus eliminating tap lag and breakage. Shallow flutes permit a thicker and stronger tap which gives longer service life. These features, assured Besly Engineers, provide a tap which can operate at higher speeds and less driving power—especially good news to Keades.

Keades now operated two automatic machines, of their own design—shown above, equipped with Besly 8 32 NC Spiral Pointed Taps which thread 2900 pieces per hour at very close tolerances. Each tap lasts 16 hours. This compares to 1500 pieces per hour with taps lasting only 4 hours, by former methods. Savings now amount to $70 per 200,000 parts.






**NEW "STRATE FACE" TAP FOR CAST IRON**

Designed for freer cutting, more accuracy, longer tap life and less tap breakage. Features — (1) straight cutting face ("Strate Face") has accurately controlled rake angle, (2) new flute and core design with high strength zone makes stronger tap, (3) "Stemite" coating prevents abrasion, stops welding, adds lubricity. Available from No. 6 to ¾" for cast iron tapping only.

**ASK YOUR DISTRIBUTOR FOR NEW TAP CATALOG 801, or write . . .**

*Engineering, Service and Specials . . . are a Besly Specialty*

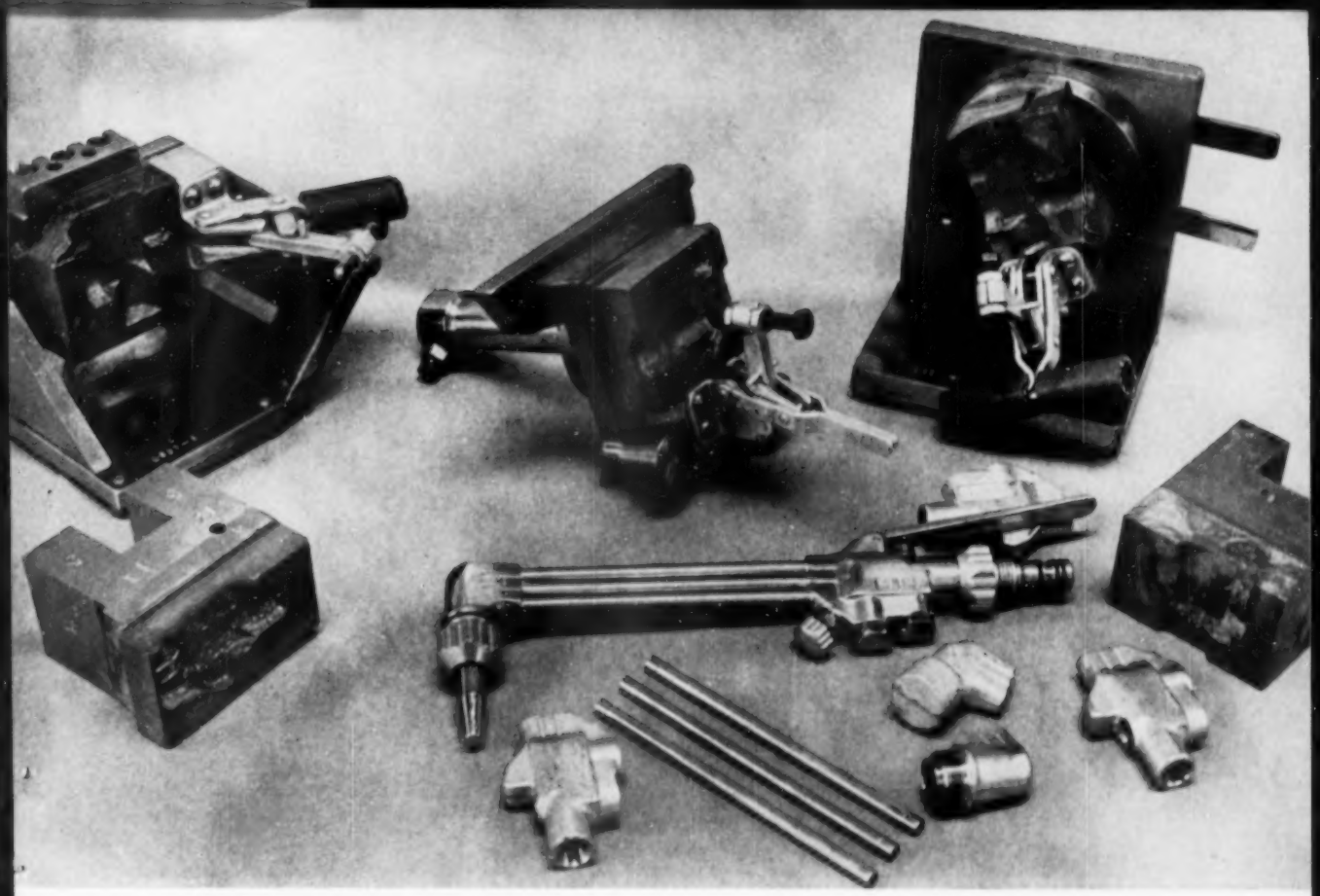
**BESLY**

**BESLY-WELLES CORPORATION**

Est. as C. H. Besly & Co. 1875

118 Dearborn Avenue • South Beloit, Illinois

**TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES • CARBIDE TIPPED TOOLS • BLANKS • TOSS-AWAY INSERTS and HOLDERS**



Cutting torch and component parts made by Smith Welding Equipment Corp., Minneapolis, Minn., are shown with some of the plastic tools used in their manufacture.

# New tools made overnight

## *with epoxy resins*



Pouring tooling compound into mold to form chuck jaws. Lining up and pouring takes about half an hour. Compound hardens overnight. These epoxy compounds are produced by **Rexolin, Inc.,** Los Angeles 45, Calif.

Short production runs, frequent design improvements, and tight production schedules can benefit from tooling with compounds based on BAKELITE Epoxy Resins. Examples range from jigs, fixtures and chucking jaws for making the small precision parts shown here, to giant checking fixtures and Keller models used in automobile and aircraft manufacture.

These tooling compounds based on BAKELITE Brand Epoxy Resins are relatively easy to handle, and they harden at room temperature. The liquid resin is mixed with its liquid hardener and poured into place. Since curing shrinkage is negligible, the resulting tools are extremely accurate. They can be machined for further precision.

These properties mean that tools of any size can be produced with speed and economy. The resin can cure overnight. You can have low-cost tools for many operations for which conventional tooling would be expensive. Write to Dept. SM-181 for free copy of our booklet, "Why Plastic Tooling."

**BAKELITE**
BRAND
**RESINS**

**UNION CARBIDE**

**BAKELITE COMPANY,** *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.
*In Canada:* Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

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American Society of Tool Engineers

# 1958 TOOL SHOW

ASTE

**PHILADELPHIA**
Convention Center
**May 1-8, 1958**

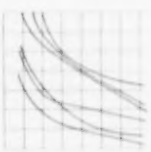
**For information :**

**EXPOSITION COMMITTEE**
American Society of Tool Engineers
10700 Puritan Ave., Detroit 38, Michigan

UNiversity 4-7300

# What every good metal man should know about CARBONITRIDING

First of all, it is a good idea to know what equipment will do the best carbonitriding job for your specific requirement. And the best way to find this out is to talk over your problems with the people who have consistently developed the methods and equipment for better, more dependable, more economical carbonitriding results. That would be Lindberg.



Let's look at the record. Lindberg's contributions to carbonitriding and carburizing go far beyond just the building of furnaces to do it. It covers the development of controlled atmosphere generators, the creation of dew point equilibrium curves to establish proper atmosphere values for type of steel and temperatures involved and the exclusive Lindberg Carbotrol to maintain these values automatically in production.



*Typical installation of Lindberg Hyen Atmosphere Generator, Lindberg Carbotrol and Lindberg Carbonitriding Furnace.*



Then there is the invention of the "dimple" vertical radiant tube which gave new efficiency and economy to fuel-fired atmosphere furnaces. Lindberg's exclusive CORRTHERM electric heating element made practical the use of electricity in atmosphere furnaces.



Add to this our record over the years of building a broad variety of carbonitriding and carburizing furnaces, big ones, small ones, manuals, automatics, fuel-fired, electric, and it seems it's just good common sense to bring your heat treating problems to us. Just get in touch with the Lindberg Field Representative in your locality or write:

**LINDBERG ENGINEERING COMPANY**

2450 West Hubbard St., Chicago 12, Illinois

Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.

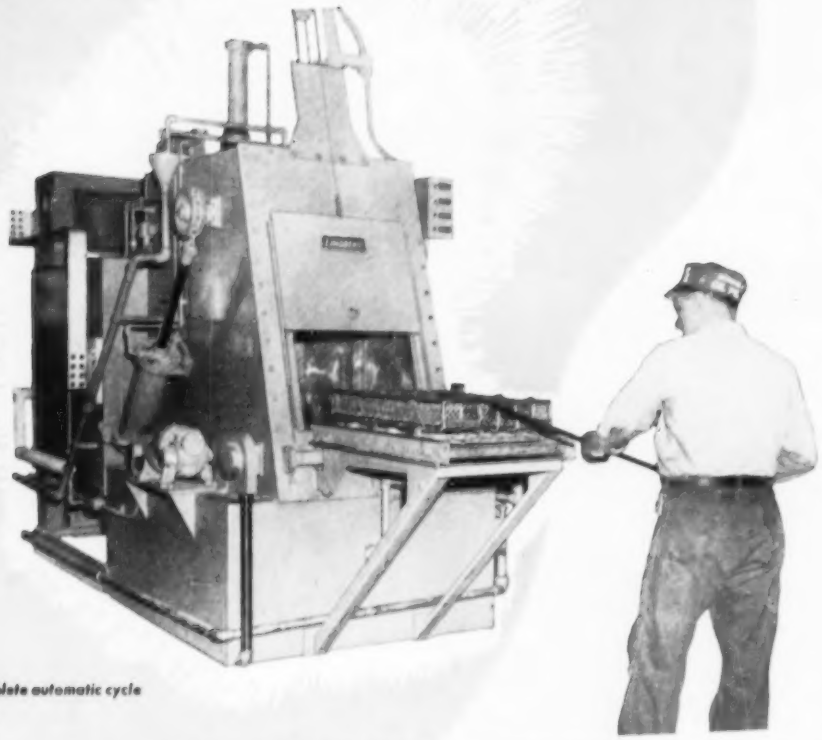


**LINDBERG**

**heat for industry**

# Here's the work-horse

## for many a carbonitriding job

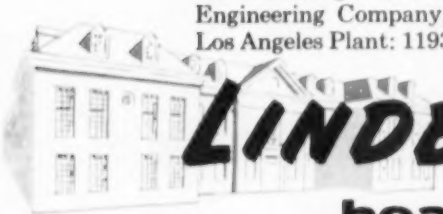


*This furnace has complete automatic cycle and quench control.*

**This is the most widely-used** carbonitriding furnace of all. Day in and **day out production** of tons and tons of work has proved this furnace's **ability to increase** production quality and volume and reduce costs. It **is a versatile** furnace, too, not only for carbonitriding but for other uses, carburizing, annealing, carbon restoration and many hardening applications.

This type of furnace is available for both manual and automatic operation. It can be equipped either with Lindberg's efficient new vertical radiant tubes for fuel-firing or for electric heating with Lindberg's revolutionary new CORRTHERM element.

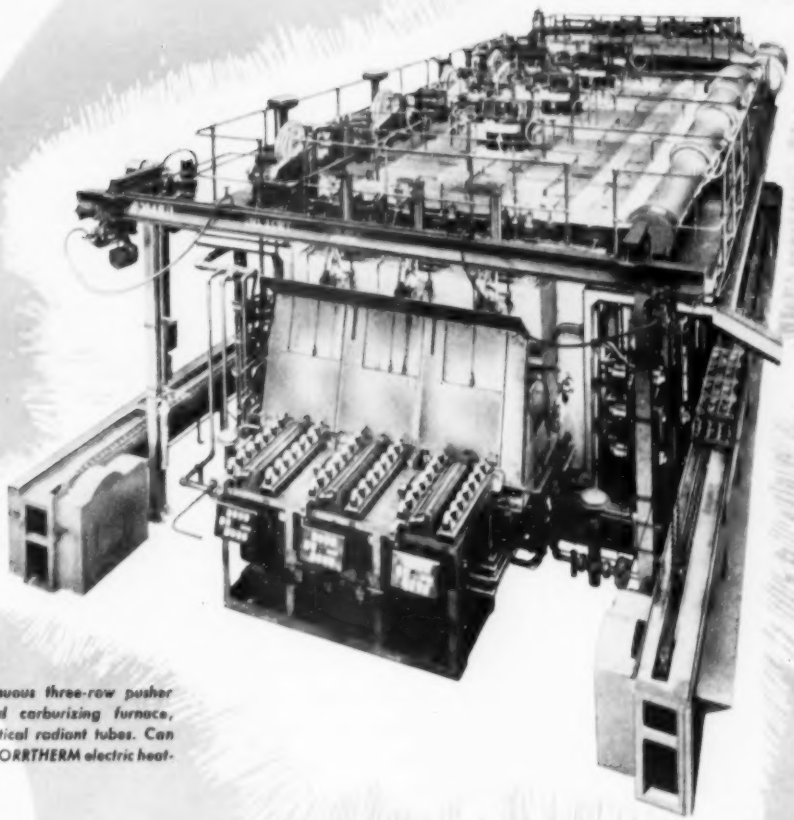
Versatile as this furnace is, we don't claim it is the best solution to *every* carbonitriding problem. But, whatever your need may be, talk it over with Lindberg. Our engineers, as they have done in so many instances, will recommend a sound answer—design it, build it, even field-install it if you wish. Just get in touch with the Lindberg plant or the Lindberg Field Representative in your locality. Lindberg Engineering Company, 2450 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.



**LINDBERG**

**heat for industry**

# We put the Big Heat on with this one!



*A Lindberg continuous three-row pusher carbonitriding and carburizing furnace, gas-fired with vertical radiant tubes. Can also be built with CORRTHERM electric heating elements.*

If your carbonitriding or carburizing problem is a big one, better talk it over with Lindberg. The broad experience of our engineering staff in the development of methods and equipment for every heat treating function offers a pretty sure promise of the most practical answer to it. Particularly where field installation is advisable our combination of engineering know-how and sound installation experience is especially valuable to you.

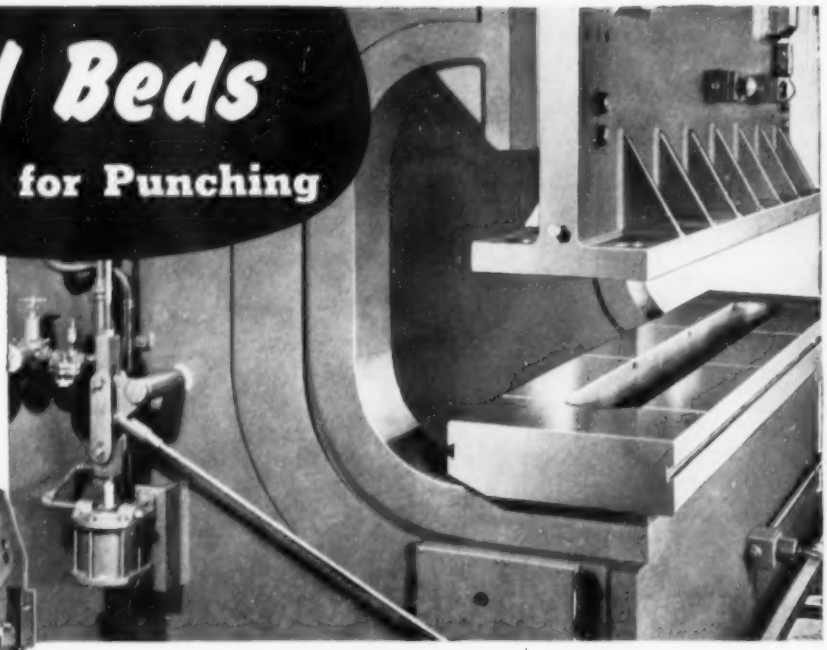
Whether your requirement will call for the installation of a big baby like the one shown above or a complete heat treating department of smaller units, Lindberg will handle the job all the way. We specialize in "turn-key" installations, covering everything from design and engineering to the finished ready-to-go-to-work job complete with all the construction needed to fit the heat treating equipment into your production processes. Pass your problem to Lindberg. Get in touch with Lindberg Industrial Corporation, 2321 West Hubbard Street, Chicago 12, Illinois, or your local Lindberg Field Representative. Los Angeles Plant: 11937 S. Regentview Ave., at Downey, California.

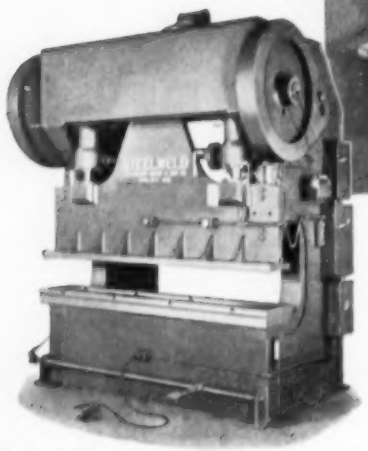


**LINDBERG**

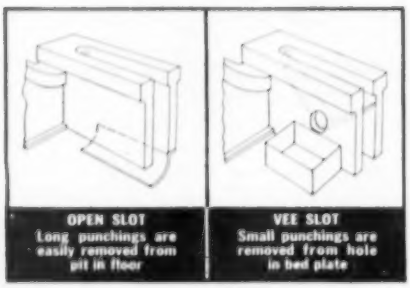
**heat for industry**

# Slotted Beds for Punching





Model H4-6 Press with slotted bed. Handles plate to 6' 0" long between end housings. Operated by foot treadle or air-electric control.



**OPEN SLOT**
Long punchings are easily removed from pit in floor

**VEE SLOT**
Small punchings are removed from hole in bed plate

## *Converts Bending Press to Punch Press... and Cuts Costs as Much as 1/2*

Because Steelweld Presses adapted for punching often cost as little as one-half that of ordinary punch presses a number of companies have purchased them and effected real savings.

Double-plate beds are usually employed with extra wide bed and ram to support the dies. In other respects the presses are standard. Machines have been built with beds as wide as 36", with slots in bed varying from 3" to 6¾" wide. The punchings drop between the bed plates (See sketches) and are easily removed from behind the machine.

The same presses used for punching can be used for bending and other forming operations. Steelweld Presses are standardized in all lengths to 20'-0" and in various capacities to 750 tons. Larger sizes and capacities on request.



***GET THIS BOOK!***

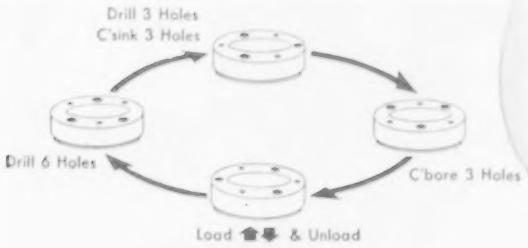
CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

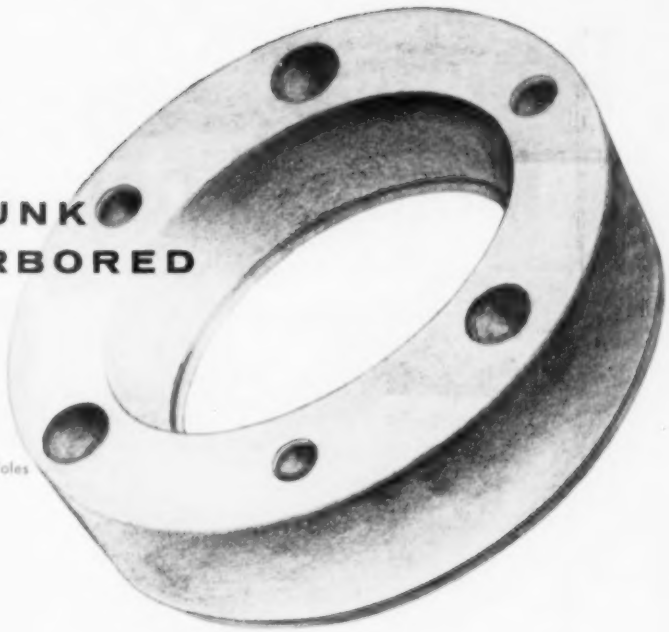
**THE CLEVELAND CRANE & ENGINEERING CO.**
8512 East 281 Street, Wickliffe, Ohio

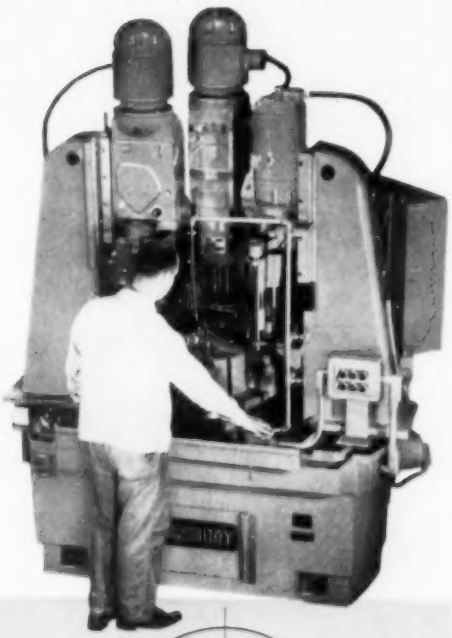
# STEELWELD
## BENDING PRESSES
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

*Automatically*

- **DRILLED**
- **COUNTERSUNK**
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**EVERY 12½ SECONDS**

**on this 4-station**

# KINGSBURY

This Kingsbury indexing automatic is fairly simple. It performs three operations on 290 steel stator races per hour (gross). Three vertical operating units have multi-spindle auxiliary heads. All tools have guide bushings to maintain accuracy. An air cylinder actuates the clamp.

Simple (like this) or complex, a Kingsbury is the best indexing automatic you can buy:

it will be fully tooled, ready to produce
it will meet your specifications for accuracy and production rate
it will pay for itself in a matter of months

We have built 5100 such machines. It is our only business. May we come see you?
Kingsbury Machine Tool Corporation, Keene, N. H.

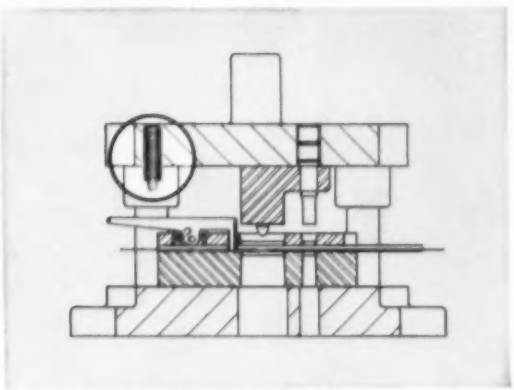
**KINGSBURY**
**INDEXING AUTOMATICS**
for high production drilling and tapping


FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-325

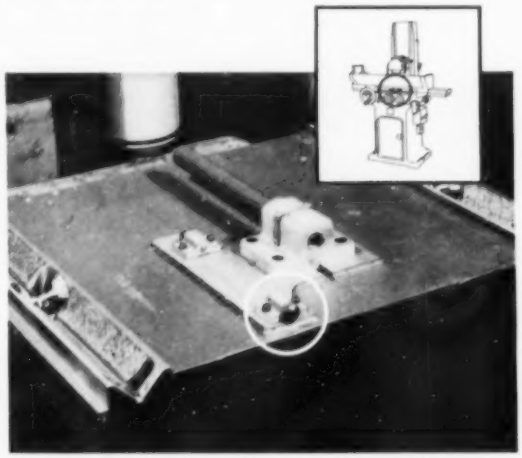
# Practical Tooling Tips

*Number 2 of a series.*

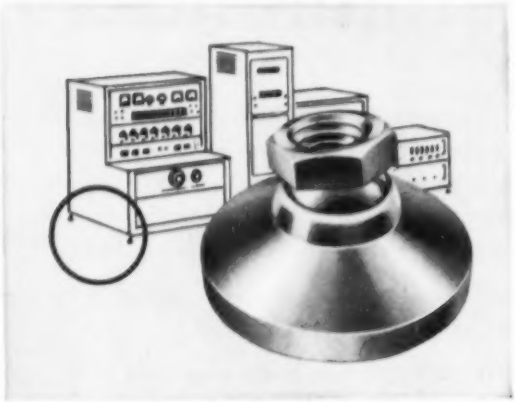
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



**TO STOP SMASHING DIE STOPS,** substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



**TO CUSHION SHOCK** as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



**TO LEVEL MACHINE TOOLS,** electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.



**TO GET NEW IDEAS** on how to save with Vlier Tooling Accessories, send for new 28-page booklet "Typical Applications of Vlier Tooling Accessories." It suggests dozens of ways to use these time-savers in both tooling and original equipment applications. Write for your copy today.

***New catalog now ready! Send for your copy today.***



*Insist on Vlier Tooling Accessories... there's still no substitute for quality!*

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NEWS FROM HAMILTON!

# O-M Built-in QUALITY

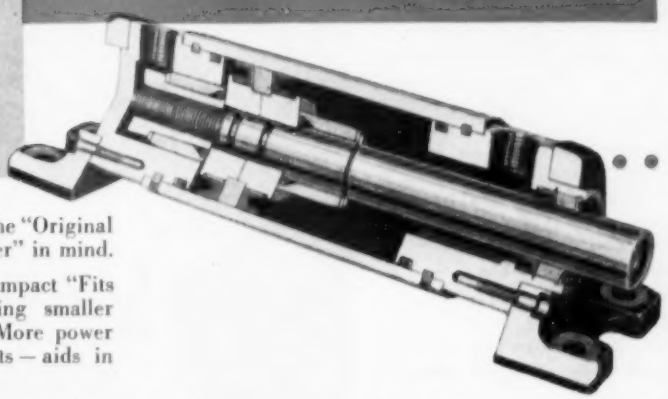
## Means Built-in ECONOMY

**O-M Tie-Rodless Cylinders 150 PSI Air– Up to 1500 PSI Oil**



**Meet JIC Standards**

**Fit Where Others Won't!**



O-M cylinders were designed with both the "Original Equipment Manufacturer" and the "User" in mind.

***Space-Saving*** – O-M is the original compact "Fits where others won't" cylinder, allowing smaller castings to be used in machines, or "More power for same space"– easily oriented ports – aids in design problems.

***Best of Materials*** – Precision honed steel barrels, bronze bearing surfaces, machined steel end covers, highly polished chromed piston rods, rod scrapers, proper packings for the various operating mediums and pressures – just to mention a few.

***Long Life*** – Quality material, accurate machining, fine finished, proper bearing materials, precision assembly, individual testing are assurance of long life.

***Easy Maintenance*** – The internal key feature not only makes it possible to save space and to easily orient ports, but also makes it easy to disassemble, inspect, clean, repair and reassemble–thus further reducing costly down-time.

***Original Cost*** – Priced right! Compare prices and quality to be convinced.

*O-M Air and Hydraulic Tie-rodless Cylinders are available in a complete range of sizes (1½" to 8" bores) with standard or heavy duty rods. Completely interchangeable parts and mounts. Immediate delivery on many sizes.*

*Mail coupon at once for Bulletins 101A (O-M Tie-Rodless Air and Hydraulic Cylinders) and 105 (O-M Series T-H – Heavy duty Hydraulic Cylinders)*



### Engineering Service

Consult an Ortman-Miller representative regarding your pneumatic and hydraulic problems. His broad experience with standard and special cylinder applications is available to you without cost or obligation. Use convenient coupon for name and address of O-M representative nearest you.

**ORTMAN-MILLER MACHINE COMPANY**

**13 143rd Street, Hammond, Indiana**

☐ Have representative call

☐ Send Bulletins 101A and 105

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Company_____

Address_____

City_____ Zone____ State_____

# NEWS FROM HAMILTON!

# 100 to 300 ton press line sets new standards

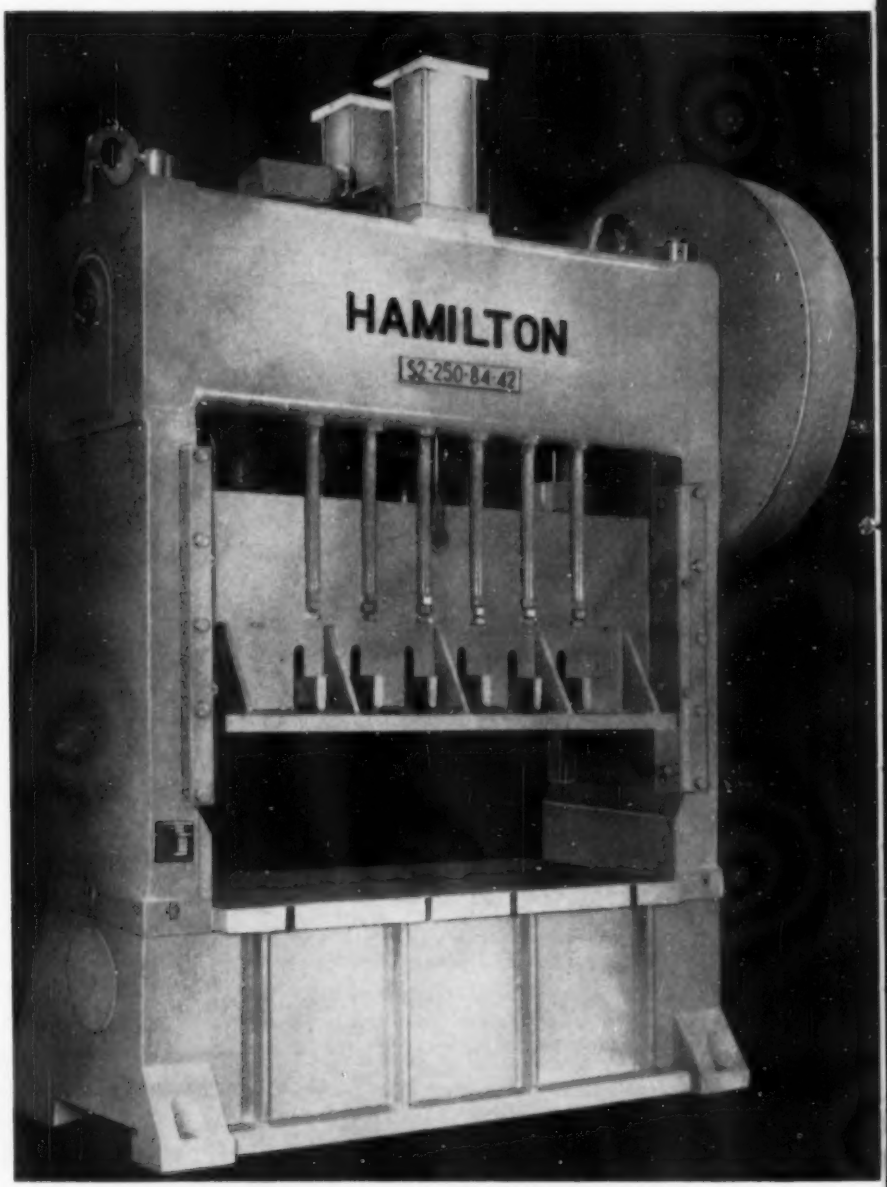
Hamilton offers you 100 to 300 ton presses built to meet exacting automotive production standards . . . standards pioneered in the automotive field through more than 30 years of Hamilton's leadership in building presses.

Every one of these 2 point, single acting, straight-side, double-crank presses is a brand new design. Each is engineered for constant top-speed, top-quality production — without profit-robbing downtime. Each is built for complete operating flexibility. Here are a few of Hamilton's design features that will mean more efficient operation for *you:*

- **mechanically interlocked air clutch and brake**
- **barrel-type motorized slide adjustment**
- **automatic lubrication**
- **pneumatic flywheel brake**
- **die lights**
- **die cushions**
- **pneumatic counterbalances**
- **interlocked electrical clutch control**

Exact specifications are adjustable to your individual requirements. Special electrical controls are available to meet particular electrical standards.

It will mean money in your pocket to find out today how these all-new Hamilton presses can help you turn out high quality stampings fast . . . without costly production downtime. Get the full story on these new 100 to 300 ton presses . . . from Hamilton Division, B-L-H Corporation, Hamilton, Ohio.

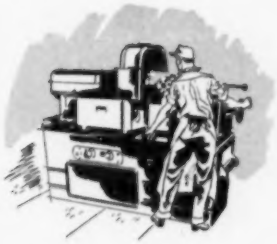



Hamilton's brand-new 250 ton double-crank press with 84 x 42 in. bed and slide.

**Hamilton Division** Hamilton, Ohio

**BALDWIN · LIMA · HAMILTON**

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools





# "TRUKUT® increased production 4 times..."

A small Mid-Western machine shop was confronted with an economic problem – production costs were too high – tool life was too short. While engaged in the job of cutting threads on 1020 16-gage electric welded steel tubing, the shop called in Sinclair Representative Raymond F. Ohm for help.

Mr. Ohm reports: "Tool life was a maximum of only 100 pieces before burning took place. Thread was very rough, due partly to chatter because of thin wall of tube."

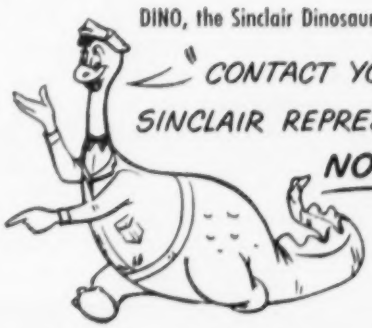
"I recommended Sinclair TRUKUT® EP Soluble Oil, Grade C, because it affords greater emulsion stability, longer tool life and better finishes with close tolerance. It also gives a greater cooling and load-carrying capacity to prevent tool welding and burning."

"With TRUKUT, *production has been increased four times.* Four hundred or more pieces are produced before tool is replaced. Also – finish of threads is finer, and general appearance of the finished piece is better."

"The shop found TRUKUT EP, Grade C, so satisfactory that it now uses TRUKUT exclusively."

If *you* have a problem with cutting or grinding coolants, it will pay you to look into the advantages of Sinclair TRUKUT EP Soluble Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

DINO, the Sinclair Dinosaur, says:




**SINCLAIR**

**CUTTING OILS and COOLANTS**



CRAWFORD H. GREENEWALT

# "$22,800,000 Invested in U.S. Savings Bonds During First Year of Thrift Plan..."

"Du Pont employees are saving about $23,000,000 each year in U.S. Savings Bonds through the Thrift Plan established by the Company in 1955. Well over 60,000 du Pont people now are purchasing U. S. Savings Bonds through payroll deduction on a regular monthly basis."

**CRAWFORD H. GREENEWALT,**
***President, E. I. du Pont de Nemours & Co., Inc.***

Here's how the du Pont thrift plan works: Employees save part of their earnings each month by payroll deductions to buy U.S. Savings Bonds, and the Company contributes one-fourth as much to buy du Pont common stock for them. The bonds are held for them by a bank and are delivered to them in annual installments, beginning four years after they join the Plan. The bank also delivers shares of stock to them when they are due.

Large or small, every company can give their employees the advantages of the Payroll Savings Plan. Installation of the Plan is simplicity itself. A Treasury representative will give you all the assistance you need to introduce the Plan or build enrollment in an existing Plan. Write: Savings Bonds Division, U.S. Treasury Department, Washington, D. C. for complete information.

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**American Society of Tool Engineers**
**10700 Puritan Avenue Detroit 38, Michigan**



1½ times actual size

# 220 MILLION PIECES

## FROM THIS 12-STATION TOOL STEEL DIE



Photo courtesy of Warner Die & Stamping Co., Cary, Illinois, makers of this die.

Tolerances on the intricate shaft-mounted spring shown here are plus .003", minus .000" . . . no burrs allowed . . . and stamping speed is better than 240 a minute. This calls for die-making precision—and a precision die set.

Reliable, consistent precision of the Danly Die Set provides the closure accuracy necessary to the performance of this fine die. After this unusually long run of a precision stamping in a tool steel die, the die set is in good condition.

Danly production methods consistently maintain the highest standards of die set precision through individual control of every critical dimension. Thousands of fine tool and die shops agree that the finest die set obtainable is usually the lowest cost insurance on any die-making investment. Find out how Danly precision can save money for you.

DANLY MACHINE SPECIALTIES, INC.

2100 S. Laramie Ave. Chicago 50, Illinois

DANLY ®



Write for new folder on **"The Importance of Die Set Precision"**

Lists and discusses all critical dimensions . . . shows how and why consistent Die Set precision is vital in every die-making operation. Send for a free copy.

# The New SCHERR MICRO-PROJECTOR with the VERTICAL design




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FEATURING

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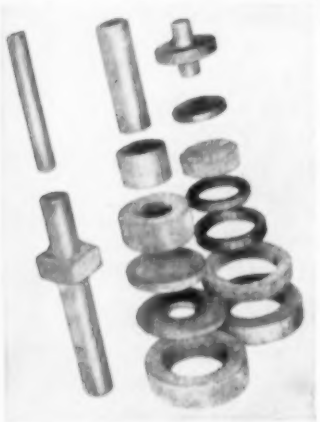
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ONE tool holder for all positions . . . No tool chatter . . . can do internal boring or internal threading . . . Ideal for carbide tools . . .

Bit sizes: ¼", 5/16", ⅜", 7/16", ½", ⅝"

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# TRUE-TRACE

MACHINE TOOL CONTROLS

*Send for new 24 page catalogue*

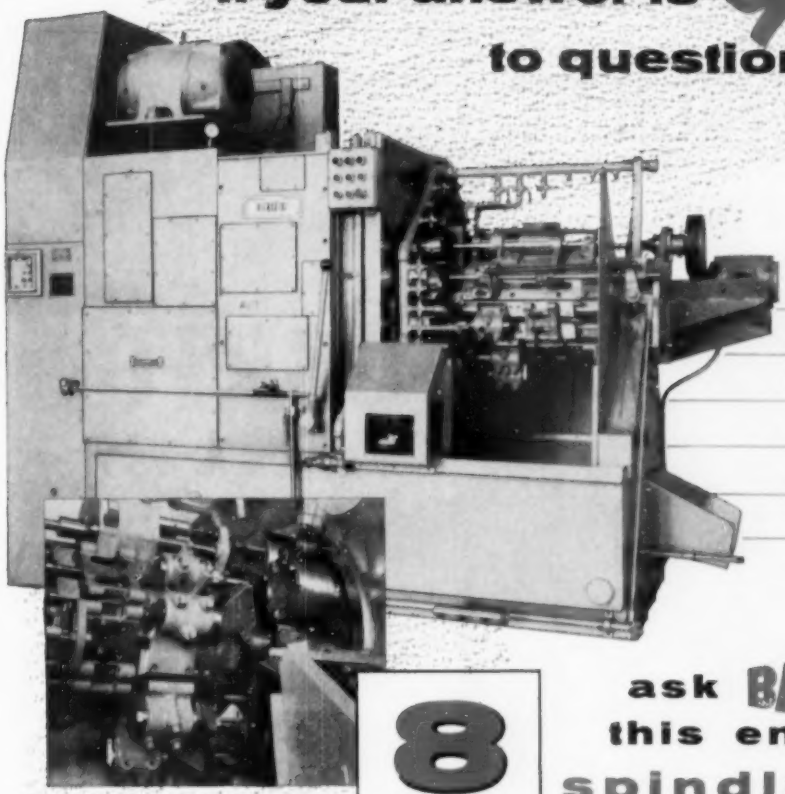
*Greater production and increased profits* thru 1, 2 and 3 slide control hydraulic tracers and numerical controls.

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# If your answer is *yes* to questions like these:



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HIGHEST PRODUCTION RATES?

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EXCEPTIONAL TOOLING VERSATILITY?

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Rear view of tooling area. Note installation of drilling spindles at top.

## 8 ask BAIRD about this entirely NEW spindle chucker

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This machine continues the well-proved basic features of previous Baird chuckers PLUS very much expanded capacity for operations and tooling. In addition to such advantages as controlled feeds and speeds for each spindle and independent strokes and feeds for each cross slide, the new universal two-stroke cross slides, with 3" max. stroke, are interchangeable among three positions covering six spindles. Individual longitudinal slides are arranged for one or two cutting strokes, and also for separate operation when used in tapping or drilling.

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Model 78H is designed for installation of latest developments in special tooling and fully automatic control, with single or double indexing, automatic chucking, auto load and unload.

Clean and open design in work and tooling areas makes even complex set-ups less costly to install and much easier to maintain.

For manufacturers who can use its tremendous production potential, this important new machine represents an outstanding step forward in unit cost reduction. You are cordially invited to send us an outline of your production requirements for study and recommendations. Write Dept. TE.

ask BAIRD about it

**THE BAIRD MACHINE COMPANY • STRATFORD, CONN.**

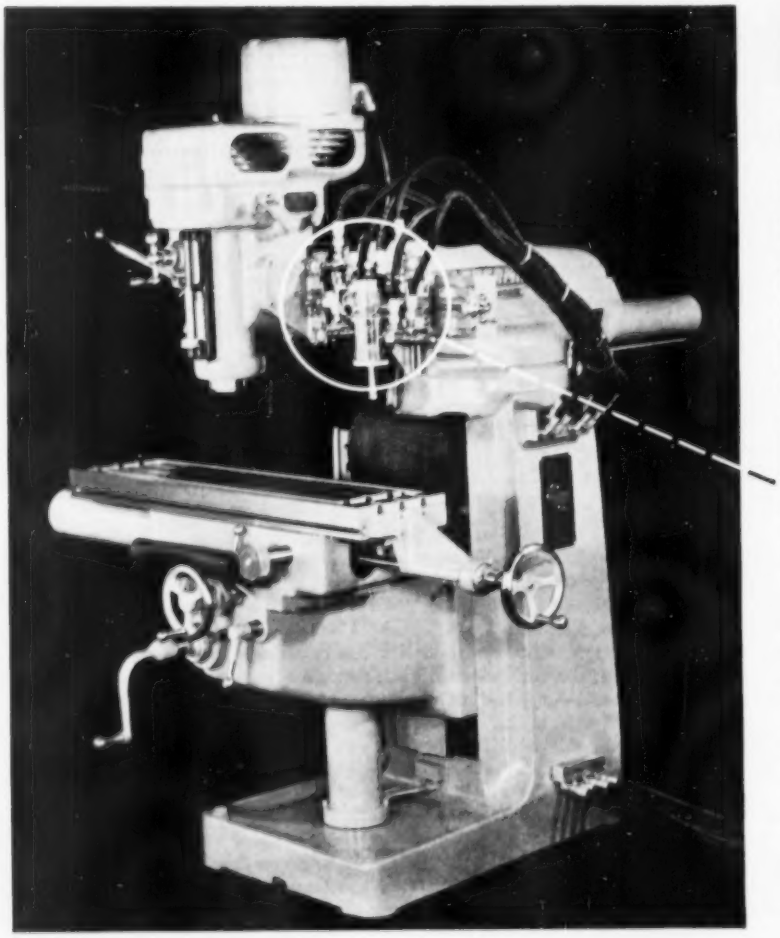
*Ask Baird about these other major aids to high production at low cost.*

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# Now "Micrometer Accuracy" Applied to Hydraulic Tracer Control

## Provides more speed in Production Profiling and Duplicating



Gorton Trace-Master Hydraulic Tracer control is today's best unit for 2- and 3-dimensional duplication, production profiling and work on all types of die forging, die casting, metal stamping, embossing and coining, as well as plastic molds in both ferrous and non-ferrous materials.

# GORTON

## *"TRACE MASTER"* Supersensitive Hydraulic Control

This master control valve is manufactured to tolerances which are NEW in the field of hydraulics. Working parts are so delicately ground and lapped that they will operate only with a very fine grade of special oil. *Ordinary hydraulic fluids are wholly unsuitable.*

**3 MODELS AVAILABLE**

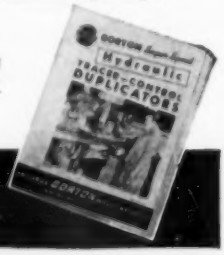
180° Vertical Hydraulic Feed to Knee.

360° Cross Hydraulic Feed to Ram and Longitudinal Hydraulic Feed to Table.

3D Hydraulic feed to knee, ram and table for 3-dimensional work.

The above can be furnished with the Gorton 1-22 Mastermil illustrated here or the Gorton 9-J Super-Speed Vertical Mill with single spindle, twin spindles and/or six inch higher column for additional vertical capacity.

*Write for complete information contained in bulletin 2771-2609.*




GORTON

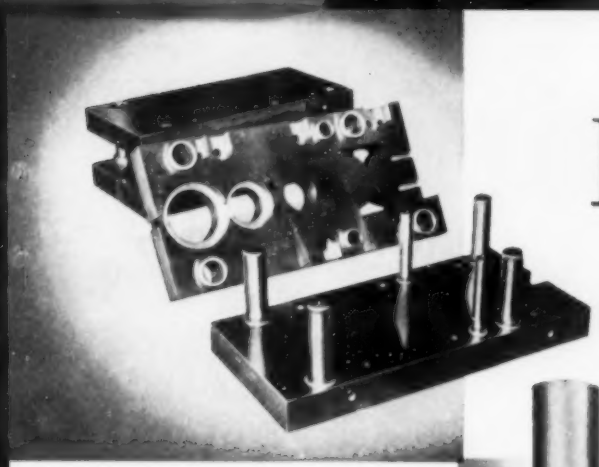
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AN INVITATION TO AUTHORS

Authors of technical papers are invited to submit them for presentation at the fall, 1958 meeting of the American Society of Tool Engineers at Los Angeles, California, September 29 through October 3. The program is sponsored by the ASTE National Program Committee.

This is an opportunity for authors to promote the growth of tool engineering knowledge and, at the same time, obtain national recognition for their contributions.

All technical papers are printed and widely distributed by the Society, giving them lasting reference value. In addition, many of the most outstanding papers are published in the Society's magazine, THE TOOL ENGINEER, generally recognized as the most authoritative magazine in its field.

The papers may deal with any field of tool engineering. ASTE membership is not required for submission of a paper. Papers will be accepted for consideration until September 15, 1957. Outlines should be sent to:

L. S. Fletcher
Program Director
American Society of Tool Engineers
10700 Puritan Avenue
Detroit 38, Michigan

Authors of accepted papers will be notified by November 1, 1957.

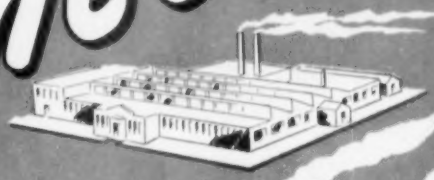
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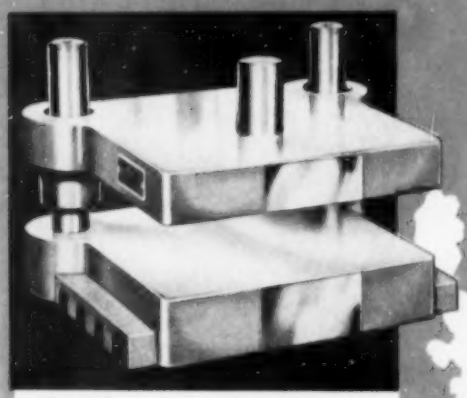
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President

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# SUPERIOR's NEW MANUFACTURING PLANT IN Connecticut



PLAINVILLE



## now manufacturing for the Eastern Tool & Die Industry

A precision die set manufacturing plant within easy reach of ALL Eastern industrial centers for faster, more thorough, direct service. Superior's highly qualified technical skill available at a moment's notice to iron out costly production delays in your plant.

SUPERIOR die sets manufactured of quality materials . . . world-renowned for their long, accurate press runs. Speed-up handling from bench to press.

SUPERIOR offers complete engineering and manufacturing facilities at plants in Milwaukee and Plainville to produce *standard* or *special* die sets from the smallest to the largest. Over 33 years of manufacturing die sets to do your job BETTER, FASTER and at LESS COST.

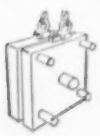
## *Exclusive* SUPERIOR TIME and MONEY SAVING *Features*



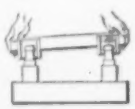
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protects fingers by providing roomy gripping space on either side of the die shoe.



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removes the danger of handling large die sets.



**E-Z LIFT SLING CHAIN**
attach to the lock-jaw for immediate lifting.



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End troublesome binding in parting dies.

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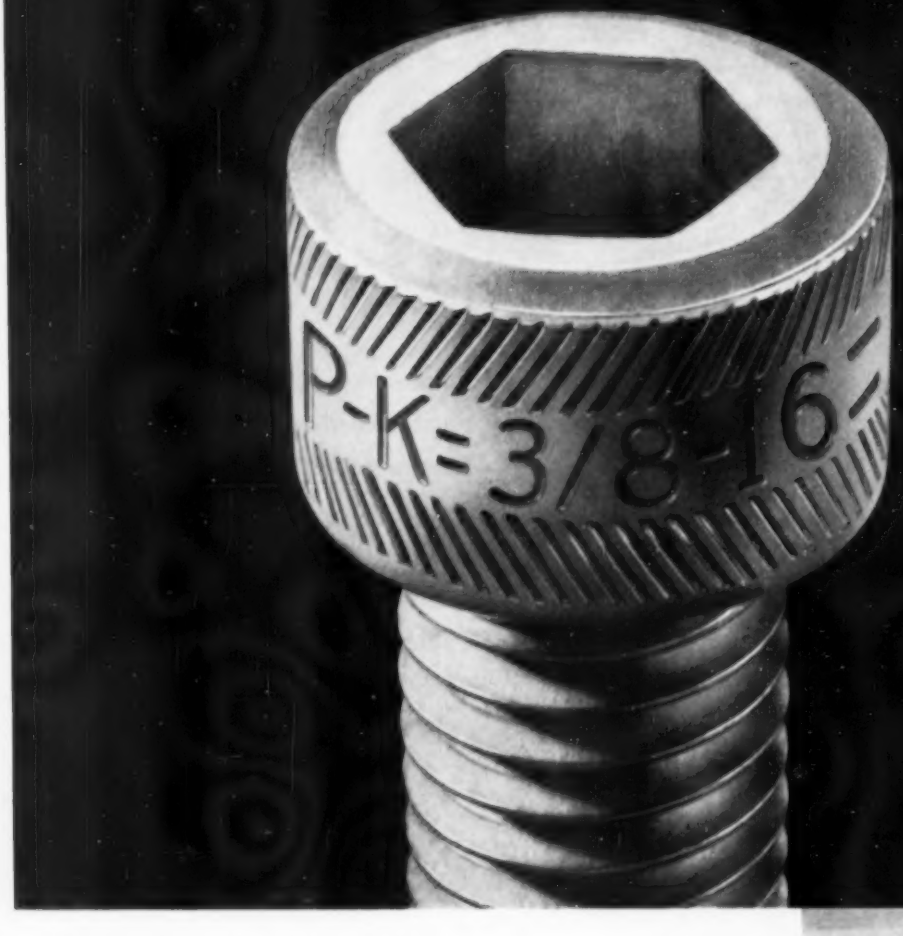
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**WEST NEWTON, MASSACHUSETTS**
Bigelow 4-2070

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After controlled heating and equally controlled uniform quenching imparting maximum strength, P-K Socket Screws are carefully tempered to assure ductility, proper elongation and high impact strength. This is your assurance that . . . *If it's P-K . . . It's O-K!*



**PARKER-KALON DIVISION,** General American Transportation Corporation • Manufacturers of Socket Screws, Self-tapping Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws.

Sold Everywhere Through Leading Industrial Distributors — Factory: Clifton, New Jersey • Warehouses: Chicago, Illinois; Los Angeles, California

**PARKER-KALON®** fasteners

ANNOUNCING!
A NEW STARRETT
HIGH SPEED STEEL BAND SAW

NEW

# Starrett®

SAFE-FLEX®




## HIGH SPEED STEEL BAND SAW

**CUTS UP TO 10 TIMES FASTER • LASTS UP TO 30 TIMES LONGER**

The finest band saw available today, this new Starrett Safe-Flex® High Speed Steel Band Saw substantially lowers costs through faster cutting at higher speeds and heavier feeds, plus greater tool life and minimum metal removal.*

It provides a cutting tool of highest quality *high speed steel*, heat treated by new techniques to produce a band of graduated hardness from super-hard teeth to a super-tough, flexible back. Ends are welded by new methods that produce a weld as strong as the parent metal.

Cuts Faster, Lasts Longer. Exhaustive tests, in our own and steel company laboratories and in large plants in many industries, prove that the new Starrett Safe-Flex® High Speed Steel Band will cut up to 10 times faster with up to 30 times longer band life. You get continuous, high speed cutting with greatly reduced down time costs. Bands pay for themselves over and over.

Red-Heat Hardness. Red-heat hardness permits heavier feeds, higher speeds. This new band stays hard even at temperatures up to 1100° F. Greater tensile strength lets you use more tension, heavier feeds and higher speeds for faster, safer cutting of harder and tougher materials.

Accurate, Efficient Cutting with Minimum Metal Removal. Band thicknesses are only .025" to .042" — far thinner than other high speed cutting tools. Extra thin section means faster cutting with less power and less chip loss — ideal for all cut-off work and for severing or slicing finished or semi-finished work.

Tooth and gullet design, engineered for maximum tooth strength, uniform stress distribution and efficient chip flow, plus sharper precision-cut teeth set with controlled accuracy, assures straight, accurate cutting with a fine finish.

Recommended for . . . Starrett Safe-Flex® High Speed Steel Bands are recommended for production cut-off work on tool and die steels and all ferrous alloys including: carbon steels, free machining steels, alloy steels, tool steels, stainless . . . also titanium and other hard-to-cut metals.

They are available through your Industrial Supply Distributor in Regular, Skip-Tooth and Hook-Tooth types in four widths and a wide variety of pitches. Call him for quality products, dependable service . . . or write for complete information. Address Dept. E, The L. S. Starrett Company, Athol, Mass., U.S.A.

**When used on machines designed for high speed steel band saws.*

Starrett

**BAND SAWS • BAND KNIVES**
**HACKSAWS • HOLE SAWS**

***World's Greatest Toolmakers***

STARRETT TOOLS

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

# lodge & shipley model X lathe paid for itself in just 18 months!

Time savings on a single workpiece, an evaporator drum 24" in diameter and 35" long, have paid for a Model X Lathe in just 18 months. The user, York Corporation, Division of Borg-Warner, records per piece savings at $25.92, saving 172.8 minutes against a previous time of 465.5 minutes per piece. Annual savings figure to $12,400!

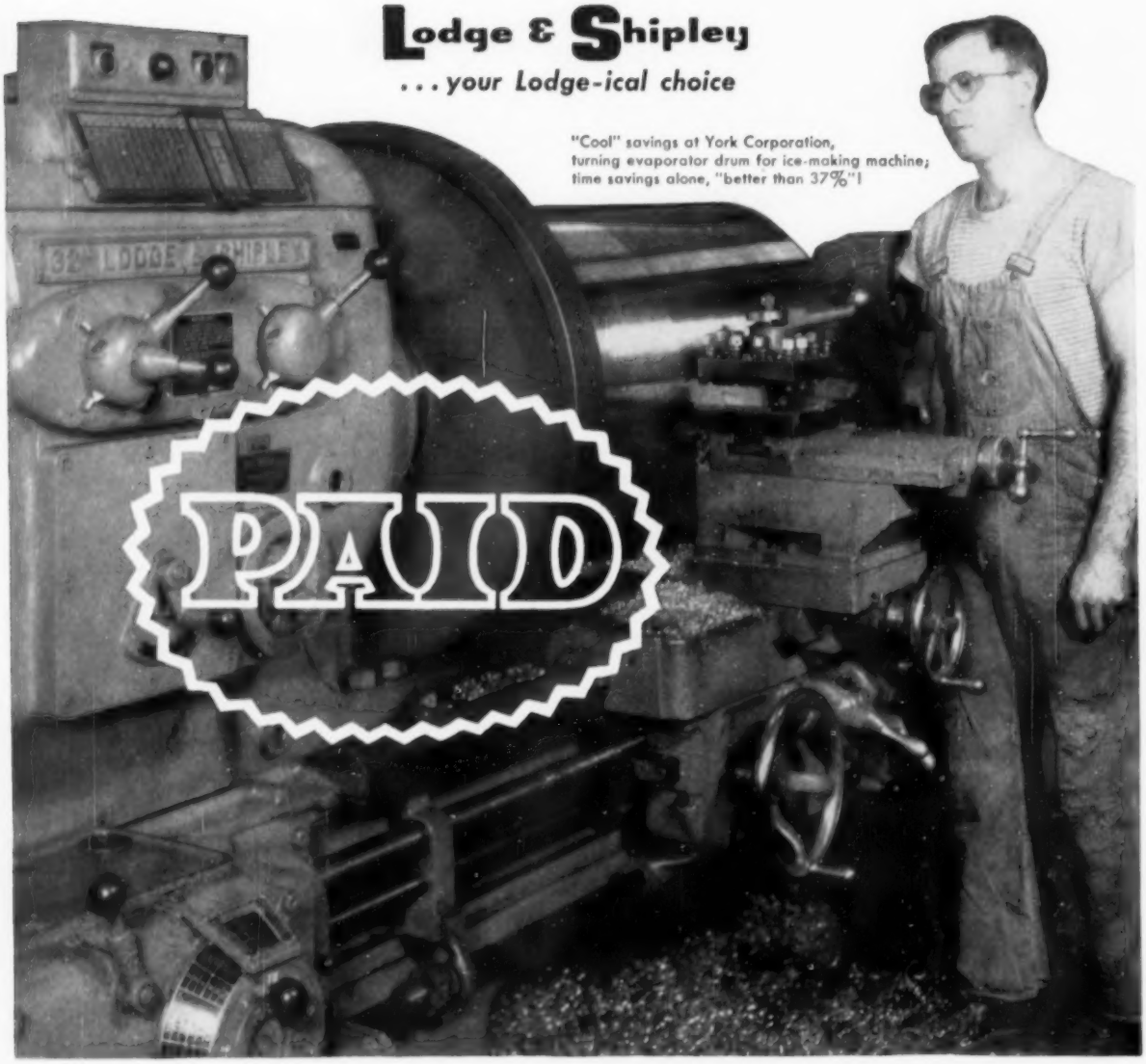
Conservatively priced yet ruggedly durable, Lodge & Shipley Model X Lathes are an outstanding value with speed, power and accuracy equal to lathes costing far more.

If you would like a complete case history report on the Model X performance outlined above, write today: **The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.**

**Lodge & Shipley**

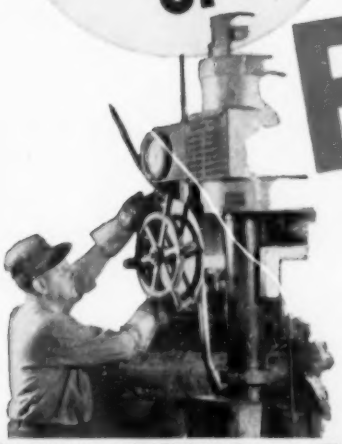
*. . . your Lodge-ical choice*

"Cool" savings at York Corporation, turning evaporator drum for ice-making machine; time savings alone, "better than 37%"!

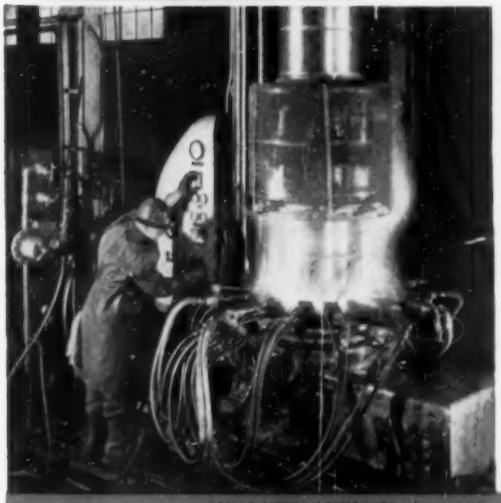


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## ...which ONLY the Commercial Heat Treater can provide



Today's modern commercial heat treating plant might well be described as a "department store" for metal treating services. For under one roof are offered you not only the full range of heat treating equipment for all types of processes . . . but . . . of still greater importance, the manpower skills of the management and technicians of those supervising and performing your jobs. *Service* is their keynote.

Whatever your needs . . . whenever you need it . . .

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**B. & W. Heat Treating Ltd.**
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*This advertisement sponsored by these Companies which are members of the Metal Treating Institute.*

# how leading car, truck and trailer builders solve production riveting problems with Hannifin "HY-POWER" Hydraulics

## 1 They select the correct size "Hy-Power" Hydraulic Cylinders



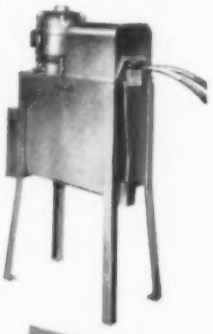
Hannifin supplies "Hy-Power" Hydraulic Cylinders in 7½ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

## 2 They mount the cylinders in Hannifin "C"-Frames



The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

## 3 Power source is the exclusive "Hy-Power" Pressure Generator



Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and high-pressure intensifier.

**HANNIFIN "HY-POWER" RIVETING IS THE LONG-TIME STANDARD OF THE AUTOMOTIVE INDUSTRY**

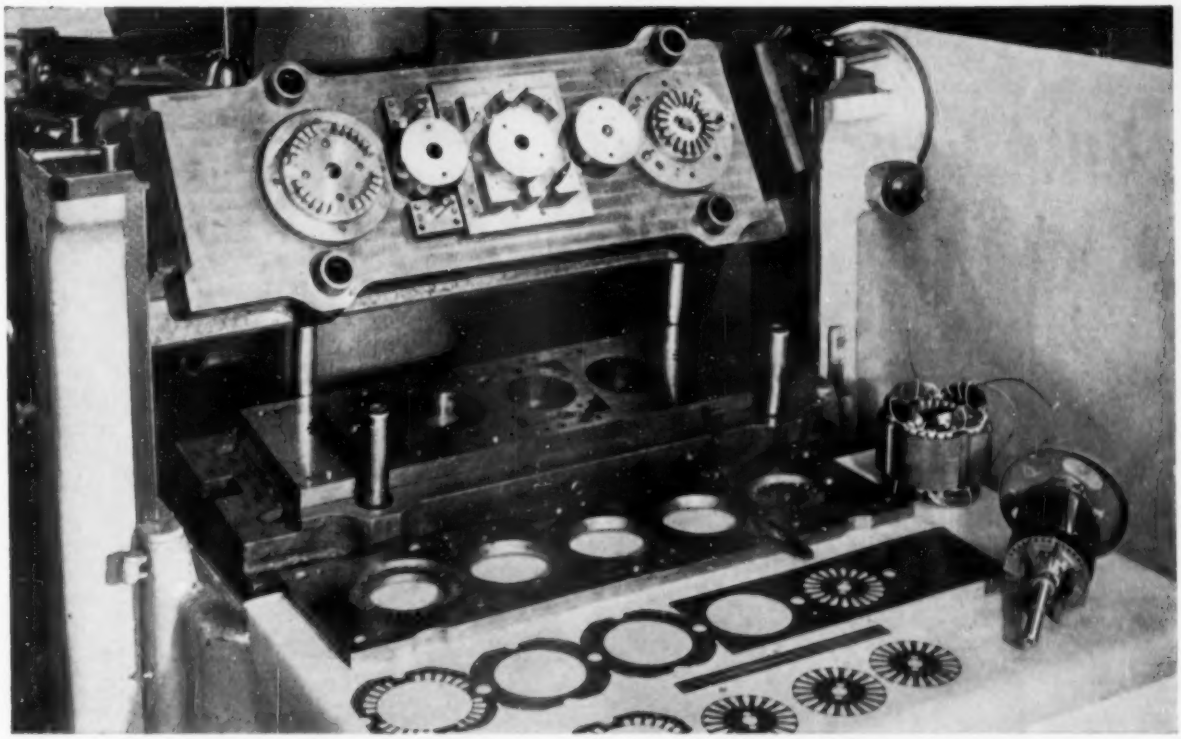
If you're looking for a better riveting method—whether you need one riveter or fifty—discuss it with your Hannifin representative. Meanwhile, get the full story by writing for Bulletin 150.



# HANNIFIN

Hannifin Corporation, 519 S. Wolf Road, Des Plaines, Illinois

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves



*LIFE magazine selected the Ehrhardt punch and die above to illustrate the Special Feature Series on AMERICA'S ARTS AND SKILLS, Part IX: Beauty in the Tools of Today.*

# This Ehrhardt die appeared in LIFE magazine ...and here is its "life story"




When a die—even an Ehrhardt die—wins a "beauty rating" in LIFE—that's news. But there's more to *this* success story—*triple plus* tells you how Ehrhardt brought the first precision tooling to the Mississippi—then grew at a rate startling to skeptics in the industry.

The above multi-stage lamination die produces rotors and stators for air conditioning equipment motors. Its complete punch alignment was checked without removing it from this Moore "die Flipper"—one of a complete battery of special machines which guard Ehrhardt's famous precision at each step, and include the latest Elox electrical discharge machining equipment.

If your own tooling ideas encompass even higher orders of precision—if you, too, foresee laboratory exactness soon being demanded routinely—if you'd rather be prepared for tomorrow than caught with your tolerances down—read *triple plus* and be ready.

Ehrhardt/St. Louis accepts and solves problems at a level of difficulty declined by all but an estimated handful of shops in the United States.

Send for the booklet *triple plus* today. Learn how this Ehrhardt concept—full range facilities, plus precision skills, plus unique experience—can add up to a profit story for you.

EHRHARDT TOOL & MACHINE CO., 914 Monroe Street, St. Louis 6, Missouri
Telephone: CEntral 1-5350

A nation-wide service to the few who want the most in high precision gages, dies, jigs and fixtures

Ehrhardt/St. Louis

**EHRHARDT TOOL & MACHINE COMPANY**
914 Monroe Street, St. Louis 6, Missouri

*Please send me a copy of* **triple plus**

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COMPANY _____

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CITY _____

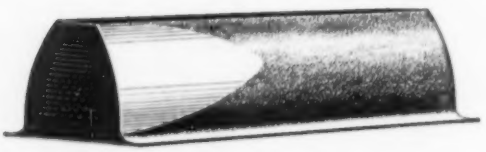
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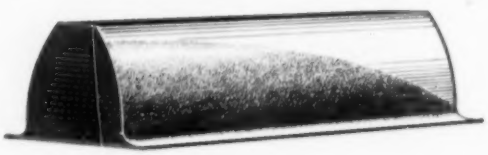
# Hard Gear Honing

**GIVES YOU BETTER GEARS AT LESS COST**

## QUICK GEAR INSPECTION

One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.







## CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.



## IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

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**5600 ST. JEAN • DETROIT 13, MICHIGAN**

7875

WORLD'S LARGEST PRODUCER OF GEAR SHAVING MACHINERY



FOR FURTHER INFORMATION, USE READER SERVICE CARD, INDICATE A-9-344

# Index of THE TOOL ENGINEER Advertisers

**September 1957 Issue**

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

*Exhibitor in 1956 ASTE Industrial Exposition

♦Subscriber to ASTE Data Sheet Service


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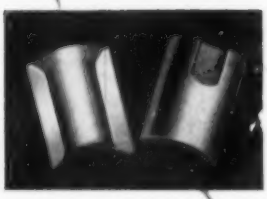
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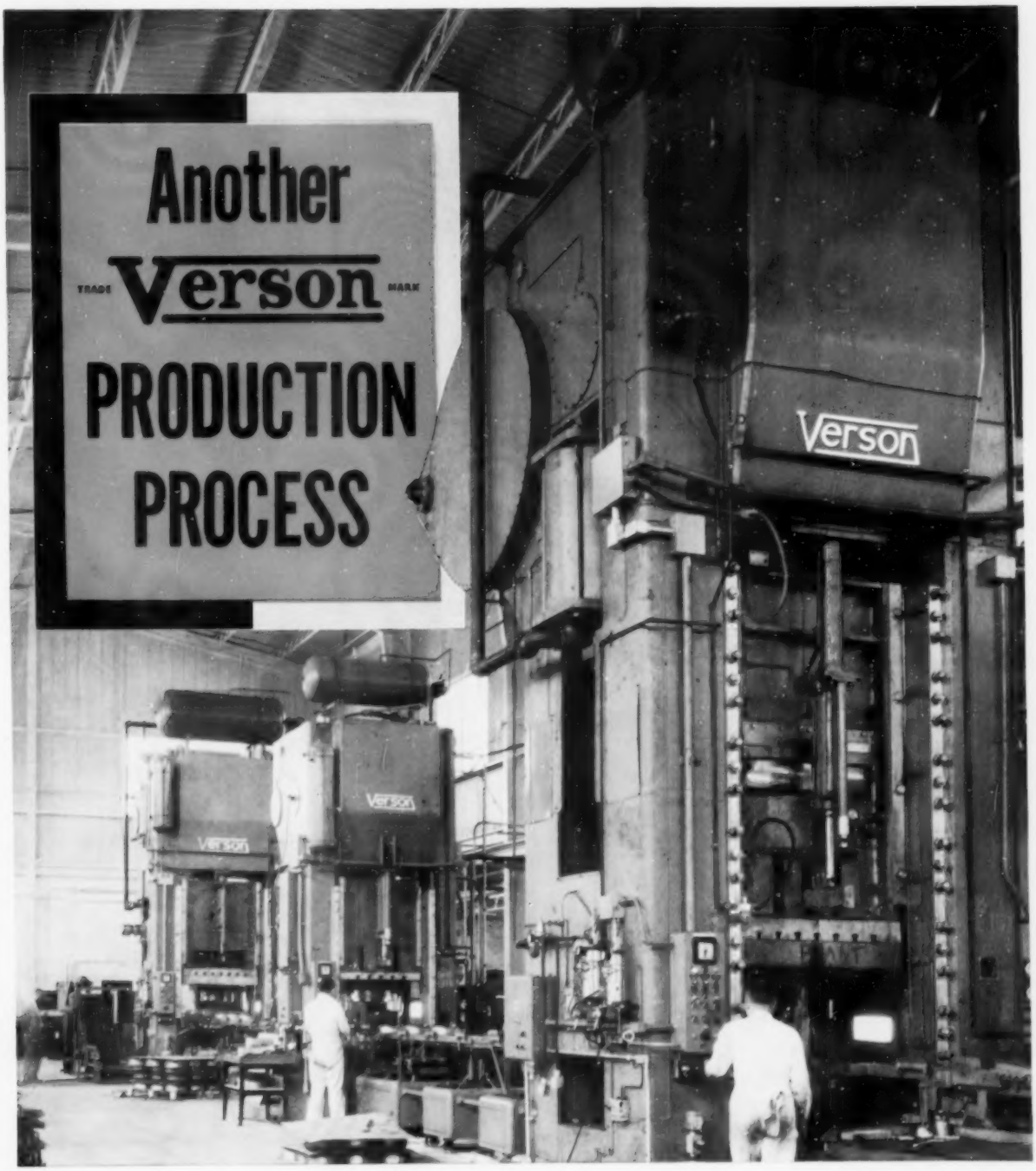
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